

# **WATER SUPPLY REPORT**

**FOR GROTON, MONTVILLE, NEW LONDON AND WATERFORD**

**PREPARED FOR THE  
SOUTHEASTERN CONNECTICUT WATER AUTHORITY**



**BY  
CAMP DRESSER & MCKEE, INC., ENVIRONMENTAL ENGINEERS,  
BOSTON, MASSACHUSETTS, MAY, 1978**



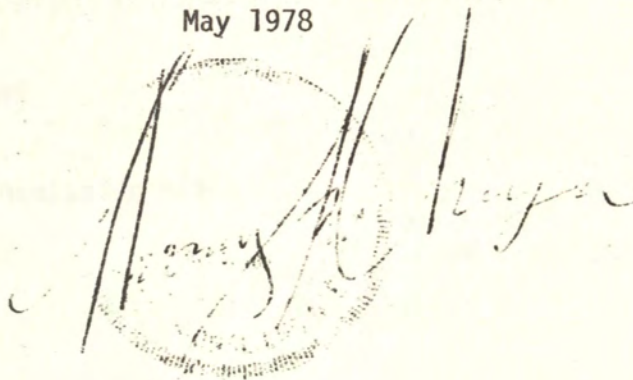




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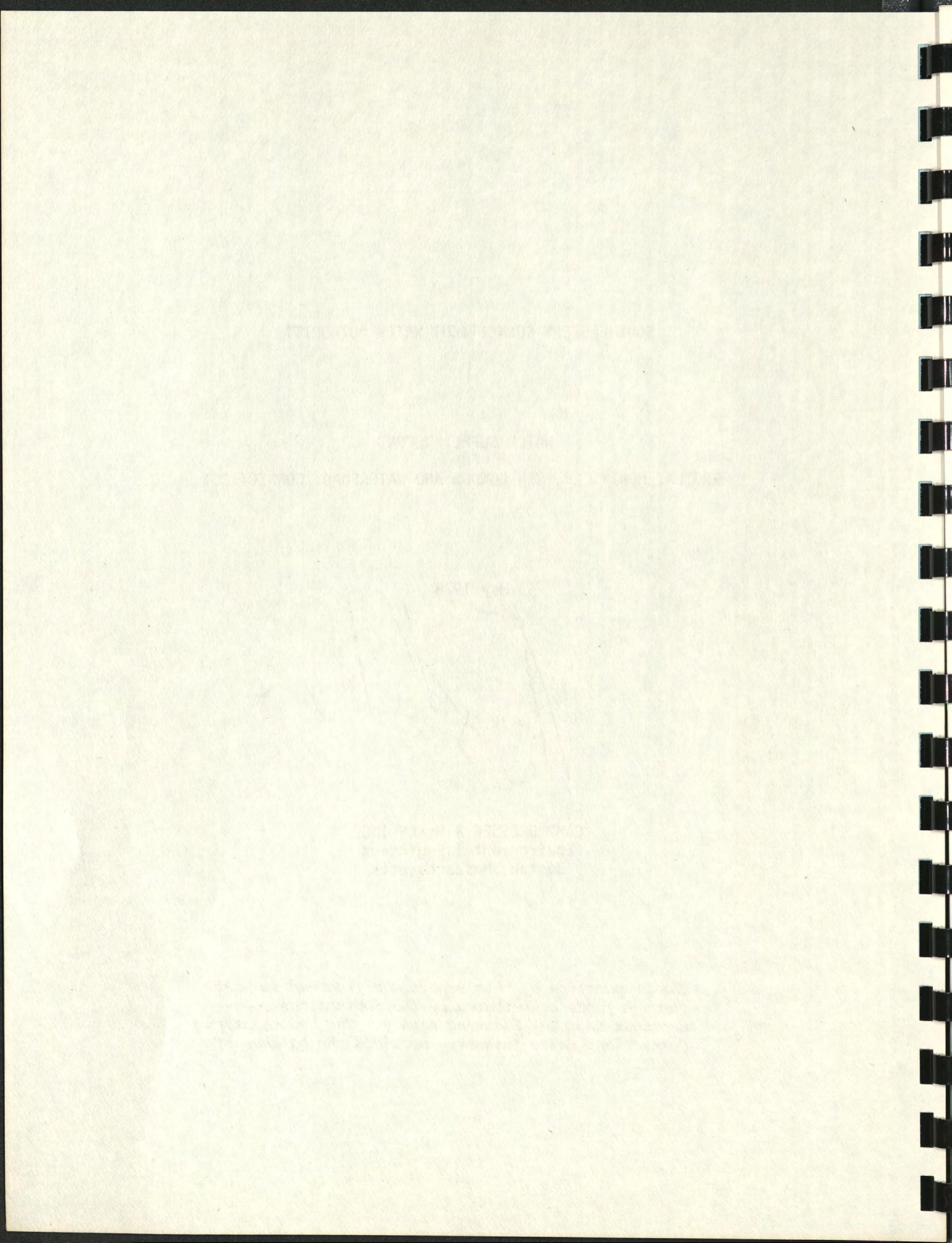
May 1978

A handwritten signature, possibly "Camp Dresser & McKee", is written over a circular embossed stamp. The signature is in dark ink and is slanted. The stamp is faint and circular, with some illegible text around the perimeter.

CAMP DRESSER & MCKEE INC.  
Environmental Engineers  
Boston, Massachusetts

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## INTRODUCTION

The intent of this study is to investigate and report on future water supply requirements of and sources for Southeastern Connecticut Water Authority (SCWA). The information presented in this study will supplement and, in some instances, update data previously provided in the Southeastern Connecticut Regional Planning Agency's (SCRPA's) 1977 Regional Water Supply Plan.

Long-term (year 2000) supply plans will be developed to meet projected consumption requirements for New London, Groton, Montville and Waterford, Connecticut. These communities were selected because SCRPA's 1977 plan projected a 1985 water supply deficit for them. Also, short-term (year 1985) supply sources capable of providing 2.0 mgd to the New London water system which are consistent with long-term plans will be investigated and recommended.

In July 1977 the City of New London officially requested SCWA to develop a water supply of 1.0 mgd by 1 June 1982, and an additional 1.0 mgd by 1 June 1985. Also, New London anticipates that their total supply requirement from SCWA may be 5.0 mgd by the year 2000. According to Special Act 381 (1967), Section 13, which establishes and defines the responsibilities of SCWA, SCWA has the jurisdiction to develop



supplies within the district for "a potential surface reservoir site with an estimated dependable yield of more than five hundred thousand gallons per day, or one or more potential wells having estimated combined yields of more than fifty gallons per minute, except for wells which are within one thousand feet of an existing water main. . ."

Accordingly, it is SCWA's legislative responsibility to provide New London's estimated and requested supply requirements.



## POPULATION AND WATER CONSUMPTIONS

The evaluation of a water supply system must take into account present requirements as well as future population and water consumption trends. Because any change from the present demand pattern would affect water supply needs, this section describes data used to estimate future water consumption demands on which subsequent recommendations are based.

The study area year 2000 population and water consumption demand projections adopted for this investigation are shown in Table 1. The population projections were provided by the Southeastern Connecticut Regional Planning Agency (SCRPA) and were based on an averaging of three methods of projection, all basically utilizing the 1974-1977 population trend. The study area's total projected population (Table 1) is generally within 10 percent of projections developed by the Connecticut Department of Planning and Energy Policy in 1976.

Projected water consumption demands were based on the SCRPA population projections and a review of historical water consumption data for each water system. A brief description for each projection follows.



TABLE 1

## PROJECTED LONG TERM-YEAR 2000 POPULATION AND WATER CONSUMPTION DEMANDS

<u>System</u>	<u>Total Population (2)</u>	<u>Population Served (2)</u>	<u>Average-Day Demand, mgd</u>	<u>Maximum-Day (4) Demand, mgd</u>
New London-Waterford <sup>(1)</sup>	59,800	57,370 <sup>(3)</sup>	9.9	13.9
Montville	22,500	18,000	2.0	4.2
Groton	50,500	42,295	14.0	16.9
TOTAL	132,800	117,665	25.9	35.0

NOTES

(1) The Town of Waterford is assumed to be served by the New London Water System in the future.

(2) Provided by SCRPA.

(3) Fay, Spofford and Thorndike, Inc. "City of New London, Connecticut - Report on Water Supply," May 1977, projects the year 2000 population served to be 64,775, based on 100 percent population served for both New London and Waterford. The above figure, 57,370, is based on a lower total population (SCRPA) and 100 percent served for New London and 90 percent served for Waterford.

(4) See text for discussion.



New London-Waterford. The projected year 2000 water consumption shown in Table 1 for the New London-Waterford system is lower than the projection adopted in the Fay, Spofford and Thorndike (FS & T) May 1977 report. Figure 1 compares the two projections graphically. Camp Dresser & McKee's (CDM's) year 2000 projection is for an average-day demand of 9.9 mgd and a maximum-day demand of 13.9 mgd; FS & T's projection is for 11.6 mgd and 19.5 mgd, respectively. The reasons for this difference are as follows:

1. CDM used the most recent SCRPA year 2000 served population projection of 57,300 or 7,405 less than FS & T's projection of 64,775.
2. CDM used an unaccounted-for water allowance of 25 percent, compared to FS & T's 30 percent. New London has already initiated an unaccounted-for water program.
3. CDM used an overall system maximum-day to average-day demand ratio of 1.4. FS & T used this same value for the New London system, but used a higher ratio of 2.0 for the Waterford system. CDM's ratio treats New London's source as supplying one integrated water system.

As shown in Table 1, the year 2000 projected average-day demand, based on the above criteria, is 9.9 mgd. This value is approximately 15 percent lower than the FS & T May 1977 projection. Considering a projection period of twenty-two years, a 15 percent difference in projections appears reasonable.



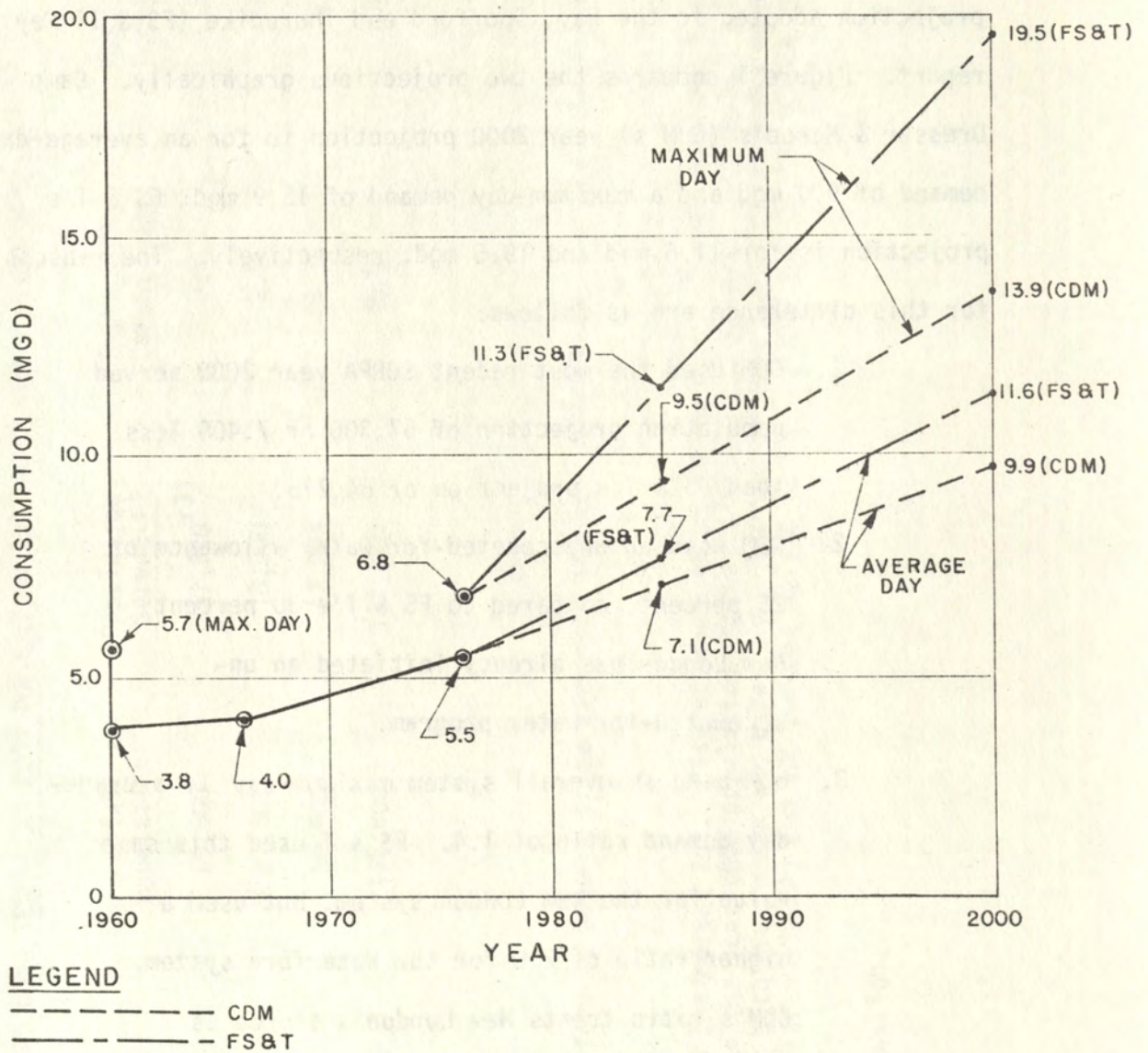


FIG. 1 - WATER CONSUMPTION PROJECTIONS - NEW LONDON - WATERFORD SYSTEM



Based on the CDM projection, the year 1985 system demand was also estimated. CDM's estimated average day demand is 7.1 mgd, compared to FS & T's projection of 7.7 mgd. As will be discussed in a subsequent section of this report, the New London system's estimated safe yield is 6.1 mgd. Accordingly, for the year 1985, FS & T's projection results in a 1.6 mgd supply deficit, and CDM's a 1.0 mgd deficit.

Montville. According to the SCRPA's 1977 Water Supply Plan, Montville had a projected 1985 overall per capita consumption value of 96 gpcd. There is no municipal water system serving Montville. Therefore, there are no historical records on water consumption available as a basis for projections. For the purpose of this investigation, it is assumed that this overall per capita value will increase by 1 gpcd per year from 1985 to 2000, resulting in a year 2000 value of 111 gpcd. Since the existing service areas are residential in nature, this increase in per capita use allows for future nonresidential uses to be connected to the water system. Based on the projected served population of 18,000, the year 2000 average-day demand is estimated to be 2.0 mgd. It is estimated that the year 2000 maximum-day demand would be 4.2 mgd, based on CDM's past experience with water systems of similar size.

Groton. Three major industrial users account for approximately 80 percent of Groton's present average-day demands. Input was solicited from SCWA and Groton officials in order to project a reasonable year 2000 system demand. Based on their existing knowledge on the probable growth and/or position of the three major industrial users in the future, a projected year 2000 average day demand of 14.0 mgd has been adopted for this study. The past 10 year average maximum-day-to-average-day



system consumption ratio is 1.21. Since it is assumed that the system will continue to have a large industrial consumption component, this same ratio has been adopted. Accordingly, the projected year 2000 maximum-day demand is estimated to be 16.9 mgd.



## CAPABILITY OF EXISTING SUPPLIES

When discussing the yield of a water supply, numerous definitions can be used such as "safe", "total", "available", etc. Terminology differs depending upon the type of source: surface or groundwater. Also, there can be a difference of opinion on what a "safe" yield really is; a 20-year low flow recurrence interval might be considered "safe" to one municipality and not to another. Accordingly, for the purpose of this investigation, the term "accepted yield" will be used. This yield is defined as the yield that the study area municipalities, or SCWA, have accepted in the past as the yield of existing supply sources. Subsequent supply deficiencies and recommendations are based on the accepted yield of existing sources.

The total accepted yield of existing developed surface and groundwater sources of supply within the study area is 20.67 mgd. Table 2 summarizes the accepted yield for each municipality within the study area. A brief discussion of existing supply sources follows, and their locations are shown on Figure A, appended.

New London-Waterford. New London's system serves both the City and the Town of Waterford. Water supply is from five interconnected surface reservoirs. The terminus of the supply system is Lake Konomoc



TABLE 2  
ACCEPTED YIELDS OF EXISTING SOURCES OF SUPPLY

	<u>Source</u>	<u>Accepted Yield</u>
Groton	Surface	13.80 mgd <sup>(1)</sup>
New London/Waterford	Surface	6.13 mgd <sup>(2)</sup>
Montville <sup>(4)</sup>	Groundwater <sup>(3)</sup>	<u>0.74 mgd</u>
TOTAL		20.67 mgd

NOTES

(1) Recurrence interval of 20 years for surface = 11.8 mgd.

Pumping of Smith Lake as a deep well into surface  
supply = 2.0 mgd.

(2) Safe yield based on 1960's drought period.

(3) Country Estates Inc.	-	1 well	=	172,000 gpd
G & J Water Company	-	2 wells	=	172,800 gpd
Kitemaug Orchard Assoc.	-	3 wells	=	74,500 gpd
SCWA - (Montville Water Division)-		8 wells	=	202,000* gpd
Oakdale Inc.	-	3 wells	=	<u>122,400 gpd</u>

TOTAL				743,700 gpd
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(4) Does not include existing supply from New London Water  
System that serves approximately 10 homes in the southwest  
section of Montville and Northeast Utilities in Uncasville.

\*Actual yield may be slightly lower.



from where the supply, after being chemically treated, is pumped into the transmission system. The accepted yield of the New London water supply system is 6.13 mgd, which was based on the 1960's drought period.

Montville. Consumers are supplied by individual private wells and five larger groundwater sources. A small area in the southwest section of the Town is also served by the New London system.

The five groundwater sources, owned and operated by Country Estates Inc., G & J Water Company, Kitemaug Orchard Association, Oakdale, Inc., and SCWA have a total accepted yield of 0.64 mgd. Locations of these sources are shown on Fig. A, appended.

Groton. The City of Groton's water supply system comprises a series of impounding reservoirs having a combined storage capacity of 2,266 million gallons. Water flows by gravity to the terminal reservoir, Poquonnock Reservoir, from which the water is treated and pumped into the transmission system. The accepted yield of the surface supply is 11.8 mgd. The City also has the capability of pumping Smith Lake into the Poquonnock Reservoir, when required. Prior reports\* prepared for Groton note that Smith Lake responds under such a pumping condition as a deep well, and has an accepted yield of 2.0 mgd.

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\*Geraghty and Miller, May 1967.



## FUTURE SUPPLY REQUIREMENTS

To be considered adequate, a groundwater supply source must have the capability of meeting the maximum-day consumption demands. Demand rates greater than maximum-day are supplied by system distribution storage facilities. Supply deficiency is based on the difference between maximum-day consumption demand and the accepted yield of the source.

A surface water supply source, to be considered adequate, must have the capability of meeting the average-day consumption demand. Demand rates greater than the average-day are supplied from reservoir system storage. Supply deficiency is based on the difference between average-day consumption demand and the accepted yield of the source.

Shown in Table 3 is the projected year 2000 supply deficiency for the study area. Based on the accepted yields of the existing supply sources, the year 2000 average-day and maximum-day supply deficiencies are estimated to be 5.23 mgd and 7.43 mgd, respectively.

When New London completes the development of a new groundwater source, commonly known as "Speed Bowl", the New London and total projected deficiency will decrease by 0.5 mgd, the expected accepted yield. For groundwater sources (e.g., Montville), the supply deficiency



TABLE 3

PROJECTED LONG-TERM YEAR-2000 SUPPLY REQUIREMENT

<u>System</u>	<u>Source of Supply</u>	<u>Accepted Yield of Existing Supplies mgd</u>	<u>Yr 2000 Consumption, mgd</u>		<u>Yr 2000 Deficiency, mgd</u>	
			<u>Avg-Day</u>	<u>Max-Day</u>	<u>Avg-Day</u>	<u>Max-Day</u>
New London	S	6.13	9.90	13.90	3.77	3.77
Montville	GW	0.74	2.00	4.20	1.26	3.46
Groton	S+GW	<u>13.80</u>	<u>14.00</u>	<u>16.90</u>	<u>0.20</u>	<u>0.20</u>
Total		20.67	25.90	35.00	5.23	7.43

NOTES:

- (1) S = Surface, GW = Groundwater
- (2) Surface supply deficiency based on accepted yield compared to Avg-Day demand.  
Max-Day deficiency for surface supply only.
- (3) Groundwater accepted yield must equal maximum-day demand or a deficiency is indicated.



was based on the sources meeting the projected maximum-day demands. However, for surface sources (e.g., New London), the deficiency was based on the accepted yield meeting the average-day demands. This is based on the premise that the accepted yield is the maximum average rate of withdrawal which can be accomplished during an extended period of dry weather without seriously depleting the source. Accordingly, small variations from the accepted yield could be realized by modifying the withdrawal rate throughout the year, as long as the average rate of withdrawal does not exceed the accepted yield of the source. Because Groton's major source (86 percent of total accepted yield) is surface, the deficiency was estimated as if the total supply were surface water.

Since the projected supply deficiency of the Groton system is only 0.20 mgd, the existing supply can be considered adequate.

Shown on Fig. A, appended, are the projected demand centers for the Town of Montville. Subsequent recommendations are based on the supply deficiency (Table 3) being located within these demand centers. The projected deficiency for each demand center is shown in Table 4 of a latter report section.



## POTENTIAL SUPPLY SOURCES

The evaluation of potential sources required to meet the projected long-term supply deficiency of the study area encompassed both ground-water and surface sources. Groundwater potential in the study area was examined, and sources were identified. Surface sources previously identified in prior studies and summarized in SCRPA's 1977 Water Supply Plan were reviewed, and their possible uses in meeting the study area's long-term supply deficiency were evaluated.

The Norwich water system has not been considered as a potential water supply source for this study. Existing water distribution mains in the southwestern section of Norwich would need to be reinforced in order to supply the future demands of Montville. In addition, Norwich is reluctant, at this time, to commit the Stony Brook Reservoir supply on a long-term basis.\*

### Groundwater Sources

The evaluation of potential groundwater sources is covered in Appendix A. The evaluation included a review of existing data, reports, well records, published estimates of long-term yields, and discussions with area officials. Also, locations that had received little or no attention in prior studies for future possible groundwater sources were

\*From discussions with C. E. Maguire, Norwich's consulting Engineers, June 1978.



examined. The evaluation was limited to locations within the boundaries of New London, Groton, Montville, and Waterford. Locations in adjacent towns were reviewed when this information was pertinent to potential sources within the study area.

A total of 46 potential groundwater sources were evaluated: Groton - 11 sources, Ledyard - 10 sources, Montville - 11 sources, and Waterford - 14 sources. The location of these potential sources is shown on Fig. A, appended, and a discussion of each, along with the basis of selection used, is outlined in Appendix A.

As shown in Table 3, all but 0.2 mgd of the long-term (year 2000) maximum-day study area's supply deficiency is located west of the Thames River. Accordingly, based on their (1) location with respect to demand centers, (2) location with respect to existing supply sources and/or transmission-distribution systems, and (3) estimated magnitude of yield, the following 16 groundwater sources were identified as having the greatest potential for development.

<u>Source Identification Number*</u>	<u>Potential Yield, mgd</u>	<u>Location*</u>
3-1	2.00	Montville - Upper Oxoboxo
3-2	1.60	Montville - Lower Oxoboxo
3-4	0.46	Montville - Oxoboxo Brook
3-6	1.40	Montville - Johnson Road
3-7	2.40	Montville - Great Plain Brook
3-8	1.00	Montville - Route 52
4-2	0.50	Waterford - "Speed Bowl"
4-3	0.26	Waterford - Jordan Brook
4-4	1.00	Waterford - Nevins Brook
4-5	0.20	Waterford - Nevins Brook
4-6	0.50	Waterford - Jordan Brook
4-7	0.34	Waterford - Stony Brook
4-8	0.20	Waterford - Gardners Wood Road
4-9	0.49	Waterford - Fenger Brook
4-11	0.36	Waterford - Old Colchester Road
4-14	0.40	Waterford - Lower Hunts Brook

\*See Appendix A and Fig. A



Source 4-4 has been considered as a potential source, although the proposed extension of Route 11 and the new Waterford shopping mall will be in close proximity. This source has the highest potential of all sources identified in Waterford, and all means necessary to ensure its integrity should be initiated. If either of these projects move forward, there is a possibility of deterioration in the aquifer supply quality. Accordingly, special provisions may be required should this source be developed in the future. For the purposes of this investigation, it is assumed that if all existing State regulations are met when the source is developed, the water quality will be adequate.

The above groundwater sources were used in the subsequent evaluation of several long-term water supply plans. The potential yields noted were determined based on the criteria outlined in Appendix A. Prior to development of these sources, additional evaluation would be required including test well programs.

#### Surface Sources

Six pertinent surface supply sources have been identified in previous reports. Listed below are the sources, along with the pertinent data.

<u>Potential Source</u>	<u>Supplement Existing Supply</u>	<u>Yield, mgd</u>
1. Hunts Brook	New London	4.9*
2. Oxoboxo Lake	New London	1.5
3. Stony Brook Reservoir	New London	2.2
4. Joe Clark Reservoir-S.B.D.	Regional	9.5
5. Haley's Brook	Groton	1.8
6. Shewville Brook Diversion(S.B.D.)	Groton	3.5

\*(Phases I and II)



Based on an examination of prior reports and data on the above surface sources, it was concluded that the Hunts Brook project, as proposed in Fay Spofford and Thorndike's May 1977 report on the New London Water System, has the greatest potential of meeting a portion of the study area's long-term supply deficiency.

The Hunts Brook project could be constructed in two phases: Phase I - Hunts Brook Reservoir, and Phase II - Hunts Brook Diversion Dam and Pumping Station. The estimated accepted yield of Phase I is 2.5 mgd, and Phase II's accepted yield is 2.4 mgd, for a total of 4.9 mgd. As proposed in Fay Spofford and Thondike's 1977 report, the yield derived from Phase II would be pumped into the reservoir created in Phase I, where water would flow into Lake Konomoc for subsequent treatment.

The Oxoboxo Lake source, which calls for the pumping of Oxoboxo Lake water into the existing New London water system watershed, has a lower accepted yield than potential groundwater sources in the area (Sources 3-1 and 3-2). Accordingly, the feasibility of this surface source, which requires treatment, when compared to using groundwater sources, results in it not being a feasible source. In addition, this recreational lake has a dense settlement of cottages, located on small lots, served by on-site disposal systems that may result in poor water quality.

At this time, it is difficult to determine if the Stony Brook source is viable, without examining in detail the long-term supply requirements of Norwich. Based on C. E. Maguire's 1968 report, Norwich will require this source in the future. Also, a water treatment plant would be required to utilize this surface source. The Joe Clark



Reservoir-Shewville Brook Diversion source is uneconomical (estimated March 1978 construction cost of \$19.9 million) for the study area.

Supplementing the Groton system, as is the case with the Haley's Brook and Shewville Brook Diversion sources, in order to alleviate projected New London, Waterford, and Montville supply deficiencies, seems unrealistic because an expensive connection to the Groton system across the Thames River would be required.

#### Summary

Based on the above discussions, three long-term plans to satisfy the projected New London, Waterford, and Montville supply deficiencies were evaluated, using the 16 groundwater sources identified as having the greatest potential and the Hunts Brook Diversion project surface source. All of the sources considered are located west of the Thames River, and are reasonably close to the areas having supply deficiencies.



### LONG-TERM SUPPLY PLANS

The supply plans evaluated focused on the most economical method of satisfying the long-term supply requirements of the Town of Montville and the New London water system. As was discussed previously, since the Groton supply deficiency was estimated to be only 0.20 mgd in the year 2000, for the purpose of this investigation the supply was considered adequate. When evaluating the New London system, it has been assumed that the Speed Bowl groundwater source will be developed at an accepted yield of 0.50 mgd, resulting in a long-term deficiency of 3.27 mgd for the New London system. Montville's future supply requirement was evaluated by dividing the Town into four major "demand centers", similar to the SCRPA 1977 supply plan. Because of the natural topography of the Town (ground surface elevations ranging from 50 feet to 600 feet), these demand centers were treated as separate service areas. The Town's long-term supply deficiency is 3.46 mgd, resulting in a total study area supply deficiency of 6.73 mgd.

Three supply plans were evaluated:

Plan A - Groundwater sources only,

Plan B - Total Hunts Brook Diversion project and groundwater sources,

Plan C - Phase II Hunts Brook Diversion project and groundwater sources.



A discussion of each plan follows, together with the associated estimated construction costs.

For determining the estimated construction cost of each plan, present day construction costs were used (March 1978 ENR Index of 2700). An allowance of 30 percent has been used for engineering, contingencies, and legal fees. The total acreage for land acquisition is shown separately and is not included in the costs, since the cost per acre will vary depending upon zoning and its current use. The construction costs shown in Tables 4, 5, 6, and 7 are based on the following criteria.

Supply. For groundwater sources, the cost includes a well testing program, development of the source, a pumping station equipped with chemical feed equipment and emergency power, and appropriate well field piping. For the Hunts Brook project, costs were derived from Fay, Spofford, and Thorndike's May 1977 report, and were updated or revised if necessary. The construction cost for booster supply pumping stations under Plan B include pumps, a building, and emergency power.

Storage and Transmission Mains. For potential sources in Montville, construction cost for a transmission main connecting the source with a storage facility is included. The cost for additional distribution system mains to meet projected demand increases has not been included. The storage facility for each service area was sized based on a basic fire flow in the service area of 2000 gpm, plus 20 percent of the area's estimated maximum-day consumption rate for hourly fluctuation storage.

Piping. For groundwater sources evaluated to augment the New London system, an allowance was made for the cost of piping to connect the potential sources with the existing transmission system.



TABLE 4

## PLAN A - LONG TERM SUPPLY REQUIREMENT SATISFIED FROM GROUNDWATER SOURCES

## TOWN OF MONTVILLE

Demand Center	Year 2000 Maximum Day Demand, mgd	Existing Supply Yield, mgd	Year 2000 Supply Deficiency, mgd	Potential Sources (1)		Estimated Construction Costs (2)		
				Source No.	Estimated Yield, mgd	Supply (4)	Storage & Trans. Mains	Total
1	1.50	0.17	1.33	3-7	2.40	\$310,000	\$ 866,000	\$1,176,000
2	1.40	0.08	1.32	3-6	1.40	310,000	658,000	968,000
3	0.46	0.17	0.29	3-2	1.60	72,000	832,000	904,000
4	0.84	0.32	0.52	3-2	-	128,000	1,110,000	1,238,000
Totals	4.20	0.74	3.46		5.40	\$820,000	\$3,466,000	\$4,286,000

## NEW LONDON WATER SYSTEM (3)

Potential Sources (1)			Estimated Construction Costs (2)		
Source No.	Location	Estimated Yield, mgd	Supply (5)	Piping	Total
4-3	Jordan Brook	0.26	\$ 60,000	\$ 42,000	\$ 102,000
4-4	Nevins Brook	0.88(6)	240,000	30,000	270,000
4-5	Nevins Brook	0.20	60,000	42,000	102,000
4-6	Jordan Brook	0.50	130,000	50,000	180,000
4-7	Stony Brook	0.34	100,000	50,000	150,000
4-9	Fenger Brook	0.49	130,000	70,000	200,000
4-11	Old Colchester Road	0.36	100,000	90,000	190,000
4-14	Lower Hunts Brook	0.24	60,000	70,000	130,000
Totals		3.27	\$880,000	\$ 444,000	\$1,324,000

## MONTVILLE AND NEW LONDON

Estimated Construction Costs	=	\$5,610,000
30% Legal, Engineering and Contingencies	=	1,683,000
Total Cost		\$7,293,000

## Notes

1. See Appendix A for detail discussion of potential groundwater sources.
2. Based on ENR Index 2700, excluding engineering and contingencies
3. From Table 3, Year 2000 maximum day deficiency equals 3.77 mgd. Excluding the "Speed Bowl" groundwater source (Appendix A source number 4-2) that is presently being developed at an estimated yield of 0.5 mgd, the adjusted year 2000 deficiency of the New London system is 3.27 mgd.
4. ECC based on developing source to demand centers deficiency only.
5. ECC based on developing source to estimated yield.
6. Estimated yield actually 1.0 mgd - See Appendix A.







TABLE 6  
PLAN C - LONG TERM SUPPLY REQUIREMENT SATISFIED FROM  
PHASE II OF HUNTS BROOK DIVERSION PROJECT AND GROUNDWATER

TOWN OF MONTVILLE									
Demand Center	Year 2000 Maximum Day Demand, mgd.	Existing Supply Yield, mgd	Year 2000 Supply Deficiency, mgd.	Potential Sources (1)		Estimated Construction Costs (2)			
				Potential Source No.	Estimated Yield, mgd.	Supply (4)	Storage & Trans. Mains	Total	
1	1.50	0.17	1.33	3-7	2.40	\$310,000	\$ 866,000	\$1,176,000	
2	1.40	0.08	1.32	3-6	1.40	310,000	658,000	968,000	
3	0.46	0.17	0.29	3-2	1.60	72,000	832,000	904,000	
4	0.84	0.32	0.52			128,000	1,110,000	1,238,000	
Totals	4.20	0.74	3.46		5.40	\$820,000	\$3,466,000	\$4,286,000	
NEW LONDON WATER SYSTEM									
	Potential Source	Estimated Yield, mgd.	Estimated Construction Costs (2)						
			Supply	Treatment	Piping	Total			
Hunts Brook Diversion Project Phase II		2.40	\$1,225,000	\$1,200,000	-	\$2,425,000			
4-4		0.87 (3)	240,000	-	\$30,000	270,000			
Totals		3.27	\$1,465,000	\$1,200,000	\$30,000	\$2,695,000			
MONTVILLE AND NEW LONDON									
Estimated Construction Costs							=	\$6,981,000	
30% Legal, Engineering and Contingencies							=	2,094,000	
Total Cost								\$9,075,000	

Notes

1. See Appendix A for detail discussion of potential groundwater sources.
2. Based on ENR Index 2700, excluding engineering and contingencies.
3. Estimated yield actually 1.0 mgd - see Appendix A.



TABLE 7

SUMMARY OF LONG-TERM SUPPLY PLANS STUDIED

<u>Plan</u>	<u>Total Estimated Construction Costs (1)</u>		<u>Estimated Annual O&amp;M(2)</u>	<u>Approximate Acreage Required(2)</u>
	<u>Montville</u>	<u>New London</u>		
A. Groundwater	\$5,572,000	\$ 1,721,000	\$ 90,000	87
B. Groundwater and Total Hunts Brook	8,663,000 (4)	7,397,000	241,000	476 (3)
C. Groundwater and Phase II Hunts Brook	5,572,000	3,503,000	154,000	117 (3)

Notes

- (1) Based on ENR Index 2700, including 30% allowance for legal, engineering and contingencies.
- (2) See text for criteria.
- (3) Based on water surface and set-back requirements, and does not include approximately three miles of downstream riparian water rights on Hunts Brook.
- (4) Includes Montville's share of estimated cost to develop and treat Hunts Brook Diversion (1.61 mgd for Montville of total 4.90 estimated yield)



Treatment. Because of the preliminary nature of this report and the status of the proposed new treatment facility for the New London water system, a conventional (excluding activated carbon filters) treatment capital construction cost of \$500,000 per mgd has been used. The construction costs shown are for the treatment facility required for the Hunts Brook incremental supply source addition only, and do not include the cost of treatment for New London's existing supply.

The estimated annual operation and maintenance cost and the total land acquisition acreage for each alternative were also determined. For groundwater sources, the estimated annual operation and maintenance cost was based on a well pumping station, operating at the source yield use, with present day (March 1978) power, chlorine and manpower costs. An annual cost of \$40,000 per mgd was used for the annual operation and maintenance cost of the Hunts Brook surface source. This cost is based on past experience for conventional (excluding activated carbon filtration) water treatment plants.

Land acquisition estimates for the development of groundwater supply sources was based on a 200-ft. radius around each well, and an allowance for a 1,000 ft. long (30-ft. wide easement) access road. The acreage required for construction of the Hunts Brook surface source was taken from the SCRPA's 1977 water supply plan.

A brief discussion of each plan follows:

Plan A. Plan A is shown on Fig. B, appended, and is summarized in Table 4. This plan calls for the utilization of groundwater sources to satisfy the total deficiency. Three groundwater sources would be used to serve Montville, and eight sources to supplement New London's water



system. The total present day estimated cost of this alternative is \$7,293,000, the estimated annual operation and maintenance cost is \$90,000, and the total land required for development is about 87 acres.

The major advantage of this plan is the ability to stage the development of sources as system demands increase. The disadvantage is operational difficulties encountered if eight separate groundwater sources are added to the New London water system, which currently is supplied from one source, Lake Konomoc, and is equipped with several distribution storage facilities. Close coordination during operation will be required between New London and SCWA.

Plan B. This plan is based on the total development (Phases I and II) of the Hunts Brook Diversion project at an accepted yield of 4.90 mgd, and supplying the New London system with 3.27 mgd and 1.61 mgd to Montville. It is estimated that Montville demand centers 2 and 3 could be adequately supplied with the construction of two booster pumping stations in Uncasville at the Waterford boundary, and at the boundary of centers 2 and 3 (see Fig. B). Demand centers 1 and 4 would be supplied by groundwater sources. Supply from the Hunts Brook Diversion project would be treated, at an estimated capital construction cost of \$2,450,000 (Table 5). The total estimated cost of Plan B is \$16,060,000. Approximately 476 acres of land and about 3 miles of downstream riparian water rights on Hunts Brook are required. The estimated annual operation and maintenance cost to treat the 4.9 mgd yield is \$241,000. In addition to the high construction cost, other disadvantages of Plan B are the inability to stage construction of the Hunts Brook Diversion project to meet New London's short-term supply deficiency, and the amount of land acquisition and downstream water rights required.



Plan C. Under Plan C, Phase II of the Hunts Brook project and groundwater sources would supply the study area's future requirements. The estimated construction cost to develop Phase II is \$1,225,000, and the estimated yield is 2.40 mgd<sup>(1)</sup>. With Phase II constructed alone, the 20-in. diameter main as recommended in the Fay, Spofford, and Thorndike report from the pumping station to Phase I reservoir would instead be constructed from the pumping station directly to Lake Konomoc (see Fig. B, appended). In addition to the Hunts Brook project, one groundwater source (Nevin's Brook, 4-4) would be developed to supply the New London system's requirements. The Town of Montville would be supplied in the same way as under Plan A, with three groundwater sources and four separate service areas. The total estimated cost of Plan C is \$9,075,000 (Table 6), and the estimated annual operation and maintenance cost is \$154,000. Land acquisition of approximately 117 acres is required, plus 3 miles of downstream riparian water rights on Hunts Brook. The major advantage of this plan is the centralization of New London's supply sources.

Summary. Table 7 summarizes the three plans evaluated. As shown, Plan A, Groundwater, results in the lowest total construction cost, estimated annual operation and maintenance costs, and amount of land acquisition required. In addition, this plan allows for an easy staging of source development as demands increase, as a prerequisite for meeting New London's short-term (year 1985) supply deficiency.

Plan A is based on the assumption that 6.37 mgd of groundwater is available, and the quality is adequate so as to not require treatment.

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<sup>(1)</sup> From discussions with Fay, Spofford and Thorndike.



The long-term viability of Plan A is dependent upon the results of an extensive groundwater testing program. At the conclusion of such a program, the quantity and quality of groundwater available will be known. If the required 6.37 mgd is not available, or if treatment is necessary at a majority of the sources, then Plan B and Plan C may be cost-effective. Also, New London is currently preparing to initiate design of a water treatment plant to treat its surface sources. The utilization of the Hunts Brook project in the future as a supplement to New London's existing sources would have an impact on the design flow and corresponding construction of the proposed water treatment plant. It would be more cost-effective if initially the treatment facility was designed and constructed with the ultimate capacity known now (for future staging purposes) rather than at a later date. Accordingly, it is recommended that Plan A be adopted for the long-term supply plan to meet the study area's projected supply deficiency, based on the premise that an extensive testing program concludes that 6.37 mgd of groundwater is available with quality that does not require treatment.



## RECOMMENDED SUPPLY PLAN

The recommended supply plan consists of an extensive groundwater testing program, and the development of groundwater sources to meet the short-term (year 1985) supply deficiency of the New London water system, and the long-range (year 2000) supply deficiency of the study area. The location of sources recommended is shown on Fig. B, appended.

### Stage 1 - Groundwater Testing Program

As discussed previously, the viability of the recommended plan (Plan A - Groundwater) is contingent upon groundwater sources of adequate quantity and quality being available.

Based on the previous considerations, it is recommended that an extensive test well exploratory program be made of all potential supply sources previously identified under Plan A. The sites (Fig. B) to be tested are:

<u>Source No.</u>	<u>Location</u>
4-3	Jordan Brook
4-4	Nevins Brook
4-5	Nevins Brook
4-6	Jordan Brook
4-7	Stony Brook
4-9	Fenger Brook
4-11	Old Colchester Brook
4-14	Lower Hunts Brook
3-7	Great Plain Brook
3-6	Johnson Road
3-2	Lower Oxoboxo



The total present day estimated cost of the testing program for the above eleven potential sources, including exploratory drilling, extended pump tests, water quality testing, and engineering is \$200,000.

## Stage 2 - Supply Requirement

The development of supply under Stage 2 is dependent upon the results of Stage 1 - Groundwater Testing Program. For the purpose of outlining a logical sequence of supply development, it has been assumed that the testing program is successful, and the tested sources are available for use. Stage 2 is divided into two phases: Phase I - Short Term and Phase II - Long Range.

Phase I. Sources capable of supplying New London's 2.0 mgd deficiency by the year 1985 will be developed under Phase I. Because of the preliminary nature of this report, it is difficult to determine which combination of the above sources is likely to be used for the 2.0 mgd requirement and an accurate distance of the selected sources from existing transmission-distribution water mains. However, in order to provide some probable total estimated construction cost for developing New London's short-term supply needs, the potential Jordan Brook, Nevins Brook, and Lower Hunts Brook sources have been used, as shown below:

<u>Source Number</u>	<u>Location</u>	<u>Estimated Yield, mgd</u>	<u>Approximate Maximum Acreage Required</u>	<u>Total Estimated Construction Cost</u>
4-3	Jordan Brook	0.26	5	\$ 120,000
4-4	Nevins Brook	0.88	9	338,000
4-5	Nevins Brook	0.20	5	120,000
4-6	Jordan Brook	0.50	7	221,000
4-14	Lower Hunts Brook	0.24	5	156,000
		2.08	31	\$ 955,000



The approximate land acquisition estimates for development of each potential source are based on the requirement of a 200-ft radius around each well. To reflect the maximum amount of land required, it has been assumed that a yield of about 0.4 mgd is expected from each well, and that three wells would be required for a yield of 1.0 mgd (e.g. source no. 4-4).

The total estimated construction cost for each source (development of supply and piping to connect to the existing distribution system) is the same as shown in Table 4, excluding well-testing. Included is a 30 percent allowance for legal, engineering and contingencies.

Source No. 4-4, Nevins Brook, is located adjacent to Waterford's industrial park. With proper design, it is assumed that the source can be developed in harmony with the industrial park.

Phase II. The remaining sources tested in Stage I and not developed under Phase I would be constructed under this phase. The sources, along with approximate amount of land required for acquisition and total estimated construction cost, are shown below.



<u>Source Number</u>	<u>Location</u>	<u>Estimated Yield mgd</u>	<u>Approximate Maximum Acreage Required</u>	<u>Total Estimated Construction Cost</u>
<u>New London</u>				
4-7	Stony Brook	0.34	6	\$ 182,000
4-9	Fenger Brook	0.49	7	247,000
4-11	Old Colchester Road	<u>0.36</u>	<u>6</u>	<u>234,000</u>
Subtotal		1.19	19	\$ 663,000
<u>Montville</u>				
3-7	Great Plain Brook	1.33	14	\$1,462,000
3-6	Johnson Road	1.32	14	1,296,000
3-2	Lower Oxoboxo	<u>0.81</u>	<u>9</u>	<u>2,717,000</u>
Subtotal		3.46	37	\$5,475,000
TOTAL		<u>4.65</u>	<u>56</u>	<u>\$6,138,000</u>

The total estimated construction cost of Stage 2 - Phase II is \$6,138,000, including a 30 percent allowance for legal, engineering and contingencies. This cost includes storage facilities (four) and transmission mains connecting the potential Montville supplies with the facilities. The locations of the above sources and the demand centers served in Montville are shown on Fig. B., appended. The approximate amount of land required for acquisition is 56 acres, and is based on the same assumptions discussed under Stage 2 - Phase I.



### Summary

The recommended supply plan is divided into two stages of development. The estimated present day costs and the anticipated supply yields of the recommended plan are summarized below:

	<u>Total Estimated Construction Costs</u>	<u>Estimated Yield, mgd</u>
Stage 1 (Testing)	\$ 200,000	
Stage 2 (Supply)		
Phase I	955,000	2.08
Phase II	<u>6,138,000</u>	<u>4.65</u>
	\$7,293,000	6.73

The estimated construction costs are shown based on March 1978 prices and would have to be updated for future inflationary changes anticipated at the time of construction. Preliminary updating may be accomplished by multiplying the construction costs quoted here on the ratio of the ENR index anticipated at the time of construction to the March index of 2700.



APPENDIX A



January

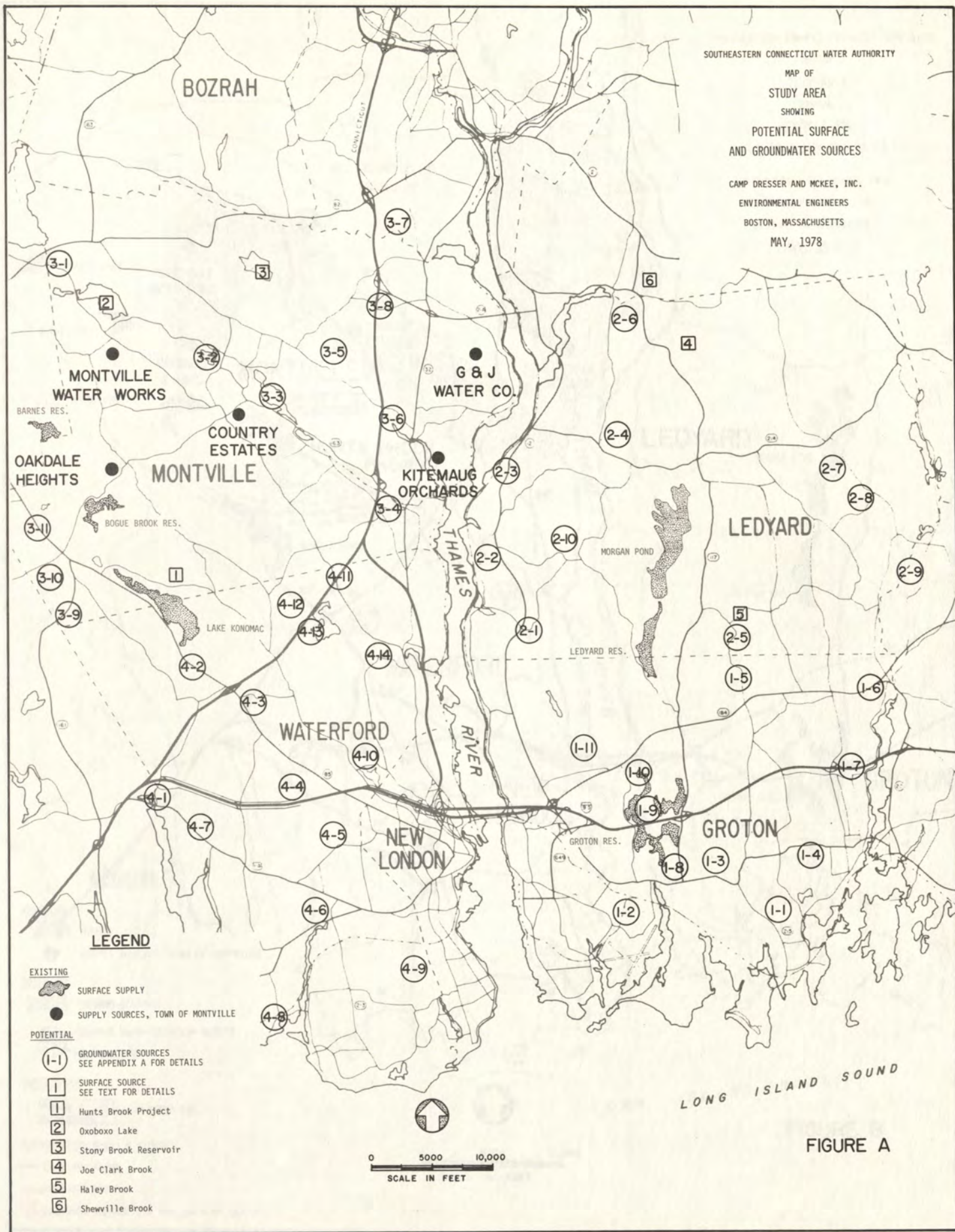
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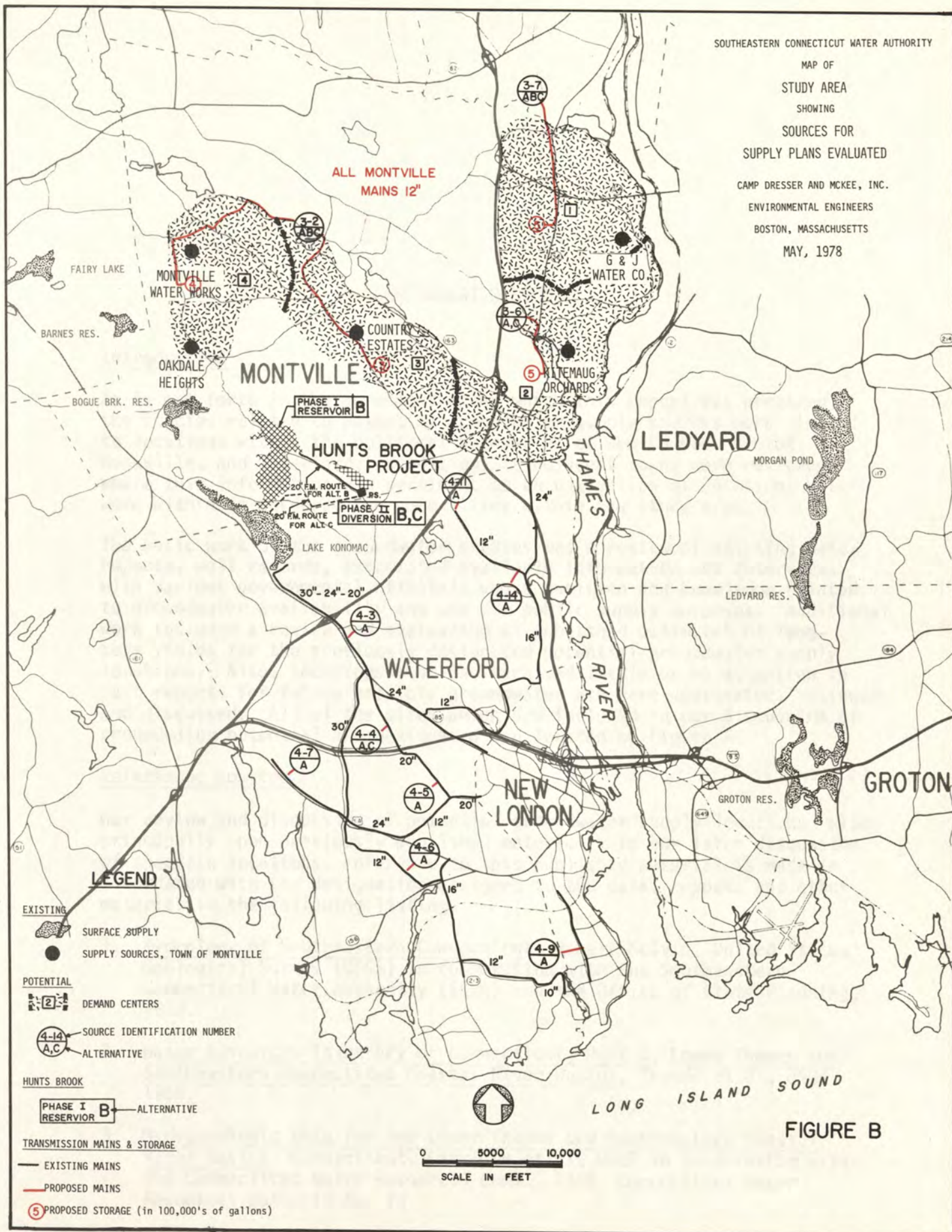






MAP OF  
STUDY AREA  
SHOWING  
SOURCES FOR  
LY PLANS EVALUATED

CAMP DRESSER AND MCKEE, INC.  
ENVIRONMENTAL ENGINEERS  
BOSTON, MASSACHUSETTS  
MAY, 1978









## GROUNDWATER STUDIES

### Introduction

As is set forth in the agreement under which this report was prepared, the studies related to potential groundwater supply sources were limited to locations within the political boundaries of New London, Groton, Montville, and Waterford. Conditions in adjacent towns were reviewed where this information was pertinent to an evaluation of locations which were within or bordered the communities within the study area.

The basic work of the groundwater studies was a review of existing data, reports, well records, associated available information and interviews with various governmental officials whose position and knowledge related to groundwater availability and use for public supply purposes. Additional work included a review and evaluation of published estimates of long-term yields for the previously designated potential groundwater supply locations. Also, locations that had received little or no attention in past reports for future possible groundwater use were designated, reviewed and discussed. All of the sites which are included in our discussion of groundwater potential are designated and located on Figure A.

### References Sources

Our review and discussion of potential groundwater supply locations relies principally upon previously published material. In our later discussion of specific locations, reference to this published material is made in accordance with the designation assigned to the data, reports and other material in the following listing.

1. Hydrology of Southeastern Connecticut, Robert Melvin, United States Geological Survey (USGS) in cooperation with the Southeastern Connecticut Water Authority (SCWA) and the Office of State Planning, 1973.
2. Water Resources Inventory of Connecticut, Part 3, Lower Thames and Southeastern Connecticut Coastal River Basins, Thomas et al, USGS, 1968.
3. Hydrogeologic Data for the Lower Thames and Southeastern Coastal River Basins, Connecticut, Cervione et al, USGS in cooperation with the Connecticut Water Resources Comm., 1968, Connecticut Water Resources Bulletin No. 16.



4. Water Supply Plan for the Southeastern Connecticut Planning Region with SCRPA.
  - a. Volume I - Inventory, 1969.
  - b. Volume II - Recommended Plan, 1970.
5. Water Supply Plan for the Southeastern Connecticut Planning Region, SCRPA, 1977.
6. Private Consultants' Reports
  - a. Town of Waterford, Connecticut Report on Proposed Water Supply System; Hayden and Harding, 1964.
  - b. Town of Waterford, Connecticut Report in Test Well Program - Jordan Brook Area, Hayden & Harding, 1965.
  - c. Report on Water Works System for Municipalities of New London and Waterford, Fay Spofford & Thorndike, 1966.
  - d. City of New London, Connecticut - Report on Water Supply, Fay Spofford & Thorndike, 1977.
  - e. Potential Water Supply Sources in the Vicinity of Oxoboxo Lake, Lenard Engineering, 1974.
7. SCWA File Information and Personal Communications as Described in Text.



## Review of Reference Sources

A review of the reference sources indicated that each publication presented supporting discussion for promising groundwater supply sites with potential for municipal use. However, little or no supporting discussion was introduced which would support decisions to omit various areas from further consideration. Brief summary descriptions of each of the reference sources were prepared as a part of a review of these publications. The summary descriptions so developed are as presented hereinafter. This summary is essentially restricted to data and information in groundwater and was included to minimize the need to refer back to the various reference sources reviewed.

## Site Specific Discussion

Both Reference 1 and Reference 2 provided generalized information on groundwater conditions and favorability in addition to site specific information on certain specific locations. The specific locations discussed were selected sites which were considered to represent those most favorable for the purpose of future groundwater use. These two references did not discuss groundwater favorability in connection with existing wells used for public water supply purposes. Reference 2 did consider some secondary sites but only designated one, bearing a designation of "e" and described as semi-favorable, within the study area of the current report.

Selection of specific sites for purposes of discussion herein has been based on the criteria of one square mile of tributary area or more, and some evidence of the sand and gravel being present in the area considered. As is noted in Reference 1, the only aquifers in southeastern Connecticut capable of large scale development of groundwater are deposits of stratified drift that are composed predominantly of sand and gravel which are commonly hydraulically connected to adjacent streams. The analytical approach used in Reference 1 produces a figure of 0.2 mgd for a Nevins Brook site. The drainage area tributary to this site, designated by Melville as Area N Strip II Model 1 (designated 4-5 hereinafter), contains no surface water bodies or any substantial swamp areas and amounts to approximately one square mile in extent. For purposes of this report, and in an attempt to exercise a reasonable degree of conservatism, a figure of 0.2 mgd for potential long-term yield per square mile of watershed has been adopted. While this figure is acknowledged to be an assigned value, it is considered to be a reasonable estimate of minimum groundwater potential for purposes of this report. Any estimate of potential yield is predicated on the basis that suitable sites can be found for the installation of wells with equal or greater capacities to the yield figures quoted.

Plate B of Reference 2 shows the general presence and extent of the stratified drift deposits mentioned above. This representation also portrays an estimate of what the saturated thickness of such deposits might be. In the review of such information, it should be kept in mind



that such estimates are made on a conservative basis--i.e., the Jordan Brook area at the junction of Nevins Brook is depicted with an estimated 10 feet of saturated sands and gravels. Also, if the shallow depths of saturated materials should prove correct, as they possibly may in a majority of instances, the cost for verifying such information during future test well exploratory programs would be minimal.

The following descriptions of site specific locations have been largely selected on the basis of meeting minimal drainage area criteria and some form of supporting evidence that sands and gravels are present in each of the areas discussed.

#### GROTON - Lower Eccleston Brook - Site 1-1

The location of this site is on the New London quadrangle sheet of the USGS topographic map series. The specific area of interest is to the north of Brook Street approximately one-half mile from where Eccleston Brook enters Palmer Cove.

Well data presented in Reference 3 includes one private well of shallow depth constructed in a sand formation about one-quarter mile south of the location designated above. The reported capacity of this well is in excess of 35 gpm.

Water quality data was not recorded for this site, or for any area in the immediate vicinity, in the references reviewed. The proximity of this site to Palmer Cove does raise a question as to possible salt water intrusion.

A yield of 0.8 mgd was adopted for this site based on a tributary area of 4.0 square miles. However, the SCWA EST Division does withdraw groundwater from this watershed from wells located just north of the Boston Post Road.

The nearest water distribution system to the specific area of interest is the public water supply system of the City of Groton at the Fitch School. Also, the Noank Fire District has a 10-inch main on Brook Street which is approximately the same distance--one-half mile--from the location designated as Site 1-1.

Our evaluation of this site for purposes of this report and consideration of the location for further study is that it appears to be of moderate, but probably not immediate, interest for a potential municipal supply purpose. This assessment takes into account the following unfavorable aspects of the site.

- a. Possible susceptibility to salt water intrusion.
- b. Potential yield assigned may be high for dry season periods due to major dependence of induced stream infiltration.
- c. Distance of about one-half mile from present distribution system piping.



The following condition is considered favorable to the site:

Potential yield likely to be of a magnitude economically feasible to exploit.

However, the possibility of housing development encroaching upon or utilizing the most promising location of potential groundwater supply facilities should be considered, and testing should be included in any future exploratory program so it can be determined if certain specific areas need to be acquired for protective purposes.

#### GROTON - Trumbull Airport - Site 1-2

The location of this site is on the New London quadrangle sheet of the USGS topographic map series. The specific area of interest is a one-half mile strip along a spur railroad right-of-way which parallels Gatti Drive.

Well data presented in Reference 3 includes two private wells near the intersection of Thomas Road and High Rock Road which are reported to be completed in sand and gravel materials. Reference 3 also identifies a well at the airport, some 2,000 feet southeast of the specific area of interest. While the airport well is a shallow dug well of only 16 feet in depth, it did exhibit a specific capacity of 16 gpm per foot of drawdown.

Water quality data was not recorded for groundwater at this site, or for any area in the immediate vicinity, in the references reviewed. The proximity of this location to Baker Cove does raise a question as to possible salt water intrusion.

A yield of 0.2 mgd was adopted for this site based on a tributary drainage area of 1.1 square mile. However, it is possible that a greater yield might be experienced from losses to the groundwater flow system from the Groton Reservoir even though this body of surface water is in an adjacent drainage area.

The nearest water distribution system to the specific area of interest is the public water supply system of the City of Groton. A 6-inch main along Gatti Drive is directly adjacent to the location designated as Site 1-2 and a 20-inch main along Thomas Road is in relatively closer proximity to the site.

Our evaluation of this site, for purposes of this report and consideration of the location for further study, is that it appears to be of minimal interest for a potential municipal supply. This assessment is based on consideration of the following unfavorable aspects of this site.

- a. Possible susceptibility to salt water intrusion.
- b. Potential small yield with respect to overall needs of the nearest water system.



In our opinion the above factors are not offset by the following conditions which are considered favorable to the site.

- a. Relative nearness to distribution system piping.
- b. Probable ease in extending electric power to the site.
- c. Favorable soil conditions and hydrologic data from data on existing wells or test work within one-half mile of the site.

#### GROTON - Fort Hill Brook - Site 1-3

The location of this site is on the New London quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of the Boston Post Road. Relatively recent development in the area has almost precluded this site from consideration. Accordingly, locations of interest are essentially limited to a small area just south of the Boston Post Road, and a second small area some 2,000 feet north of the Boston Post Road.

Well data presented in Reference 3 includes a shallow observation well of only 15.2 feet in depth completed in sand and gravel. This well was reported to be used by the City of Groton to measure water levels for the Sewer Authority. No other references reviewed record any additional well data.

Water quality data was not recorded for groundwater at this site, or for any area in the immediate vicinity, in the references reviewed. However, it should be noted that the Town of Groton landfill is the site's tributary area.

A yield of 0.28 mgd was adopted for this site based on a tributary drainage area of 1.4 square mile. No other figures are available, in any reference reviewed, to provide a basis by which this figure might be compared.

The nearest water distribution system to the specific area of interest is the public water supply system of the City of Groton. A new 12-inch water main crosses one of the specific locations designated within Site 1-3 and an 8-inch main in a subdivision north of the Boston Post Road appears to be in close proximity to the second specific area considered.

Our evaluation of this site for purposes of this report and consideration of the location for further study is that it appears to be of minimal interest for a potential municipal supply purpose. This assessment is based on consideration of the following unfavorable aspects of the site.

- a. Potential small yield in respect to overall needs of the nearest water system
- b. Potential leachate contamination from the Town of Groton landfill.



In our opinion the above factors are not offset by the following conditions which are considered favorable to the site.

- a. Relative nearness to distribution system piping.
- b. Possible presence of permeable subsurface conditions from related but inconclusive data.

#### GROTON - Fishtown Brook - Site 1-4

The location of this site places it on the Mystic quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of the Boston Post Road.

Well data presented in Reference 3 includes both test wells and production wells installed by the Eastern Water Company (SCWA - EST Division). A test well near where Fishtown Road crosses Fishtown Brook was installed and removed in 1959. At this location, sand and gravel were reported to a depth of 25 feet (refusal) but no pumping information was provided to indicate if this formation would yield water. About one-half mile north of this location the Company operated two gravel packed wells with a 100 gpm pump installed in the other well. Depths for these wells, completed in a sand and gravel formation, were recorded at 39 and 45 feet, respectively. The specific capacities for these wells were recorded, respectively, at 4.2 and 9.1 gpm per foot of drawdown. Another test well, installed for the Company, is reported near the junction of Eccleston and Fishtown Brooks. Here, sand was reported to a depth of 44 feet, but appeared to include increasing amounts of silt or clay with increasing depth.

Water quality data (September 1977) for Well No. 1 and Well No. 2 showed iron in concentrations of 0.0 and 1.5 mg/l, respectively, and manganese concentrations at 0.09 and 0.05 mg/l, respectively.

A yield of 0.2 mgd was adopted for this site based on a tributary drainage area of 1.0 square mile.

The nearest water distribution system is the system operated by SCWA-EST Division. The location of Site 1-4 is within 1,000 feet of the distribution piping of this water system.

Our evaluation of this site for purposes of this report and consideration of the location for further study is that it appears to be of interest for a possible supplementary supply source for the general area which surrounds it. This assessment takes into consideration certain unfavorable aspects such as:

- a. Relatively low potential yield.
- b. Reported unfavorable exploratory program results to the south of the Boston Post Road.



Aspects which might be considered favorable area:

- a. Relative close proximity of existing distribution system piping.
- b. Potential yield, while not large, is equal to existing well capacities and might be of interest to accommodate a moderate increase in water demand.

GROTON - Haleys Brook - Site 1-5

The location of this site is on the Uncasville quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of the intersection of Lambston Road, Haleys Road and Quaker Farm Road in Groton.

Well data presented in Reference 3 does not include any water wells in the immediate vicinity. There is an extensive area depicted as stratified drift deposits shown on Drawing Number 1 of a 1977 plan by Lenard Engineering entitled "Water Yield Study - City of Groton." These deposits are shown to extend from the area designated as Site 1-5 northerly along the course of Haleys Brook for some two miles or more. It is assumed that this information is a repeat of the mapping shown on Plate B of Reference 2.

Water quality data was not recorded for groundwater at this site, or for any area in the immediate vicinity, in the references reviewed.

A yield of 0.6 mgd was adopted for this site based on a tributary drainage area of 3.0 square miles. It should be noted that this is at considerable disagreement with the surface water yield figures of the Haleys Brook Diversion Report (Reference 6f) which quotes 1.8 mgd. However, a surface water impoundment and diversion is capable of capturing most of the stream runoff, which is lost to a groundwater facility, during periods of high precipitation. It should also be noted that the groundwater yield figures are based on an adopted conservative basis to serve as a possible minimum reference for purposes of comparison and evaluating interest for recommendations concerning desirability for further detailed study of the various site specific locations discussed in this report.

The nearest water distribution system is that of the City of Groton which is some 2.3 road miles distant from the location designated as Site 1-5. Reference 6f and the discussion of a possible impoundment and surface water diversion included in Reference 5 indicate that one of Groton's reservoirs (Morgan Pond) is at a distance of about 9,500 feet.

Our evaluation of this site would, at least preliminarily, have to concede that the yield figures favor surface water diversion. This does not mean that the development of a groundwater facility should be automatically ruled out. The presence of extensive stratified drift would indicate that any impoundment would probably not impede groundwater flow in the area and a well downstream of any such impoundment might provide a useful supplemental source of water at some future date.



#### GROTON - Lower Haleys Brook - Site 1-6

The location of this site is on the Old Mystic quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of the junction of Haleys Brook and its tributary, Red Brook. This should not preclude an extension of this interest either upstream or downstream of the particular location noted above.

Well data presented in Reference 3 does not include any water wells in the immediate vicinity. A state highway boring (40B) made for the Route 184 crossing of Red Brook, a tributary of Haleys Brook, describes a layer of black topsoil. Further layers of sand are present to a total depth of 54 feet. Plate B of Reference 2 shows extensive stratified drift deposits which follow the course of Haleys Brook from the Mystic River to a point some 1.5 miles upstream.

Water quality data was not recorded for groundwater at this site, or any area in the immediate vicinity, in the references reviewed.

A yield of 0.8 mgd was adopted for this site based on a tributary drainage area of 4.0 square miles which excludes the drainage area of Upper Haleys Brook north of the intersection of Quaker Farm Road and Lambstown Road.

The nearest water distribution system is the system of the Mystic Valley Water Company. It would appear that the distribution piping of this system would be nearly one-half mile from the location designated as Site 1-6.

Our evaluation of this site for purposes of the location for further study is that it does appear to be of interest. This assessment takes into consideration both favorable aspects and the following less favorable aspect.

- a. Eastern portion of Haleys Brook Valley is possibly susceptible to salt water encroachment from the Mystic River.

We do not feel that the above factor should necessarily exclude this area from further study. The following factors would favor consideration as a potential location for a source of groundwater supply.

- a. The area extent of stratified drift in the general area of interest is of sufficient magnitude to favor further study of groundwater potential.
- b. The general area is not at an unreasonable distance, approximately one-half mile, from existing distribution piping.
- c. Potential groundwater yield assigned to the area is of sufficient magnitude to indicate that the development of a groundwater supply in this general location would probably be of economic practicality.



#### GROTON - Bindloss Brook - Site 1-7

The location of this site is on the Old Mystic quadrangle sheet of the USGS topographic map series. The specific area of interest would be the area along the lower 1,500 feet of the brook course as it enters the Mystic River.

Well data presented in Reference 3 describes two private shallow water wells in the immediate vicinity. At one location, water bearing sand was encountered, under artesian conditions, at a depth of 18 feet, in a well with a total depth of 20 feet. At a second location, adjacent to Bindloss Brook and some 1,000 feet from the Mystic River, a well was reported to have been completed in till.

Water quality data was reported in Reference 3 for the first of the two wells noted above. This report indicated good quality water with negligible iron and a low chlorine value of 7 was reported despite its proximity to the Mystic River.

A yield of 0.28 mgd was adopted for this site based on a drainage area of 1.4 square mile.

The nearest distribution system is the system of the Mystic Valley Water Company whose water mains cross or are directly adjacent to the site in question.

Our evaluation of this site, for purposes of this report and consideration of the location for further study, is that it appears to be of minimal interest. This assessment is based on consideration of the following unfavorable aspects of the site.

- a. Possible susceptibility to salt water intrusion.
- b. Questionable nature of subsurface aquifer materials.

In our opinion, the above factors might be offset by the following condition which is considered as favorable to the site.

- a. Relative nearness to distribution piping.

However, it would be suggested that the highway borings taken for Interstate Route 95 be checked as a part of any future groundwater study in which exploration of this particular site would be considered.

#### GROTON - Groton's Reservoir System - Sites 1-8, 1-9, and 1-10

The location of these sites extend through the system of surface water reservoirs maintained by the City of Groton from the area near the existing filtration plant to the area north of Buddington Pond.



Well data presented in Reference 3 includes information on test wells installed by the City of Groton, private water wells and test holes, which encompass the Groton Reservoir and Smith Lake (Pogonock Lake), and which were installed for various purposes. Highway borings for the New London Turnpike showed some 26 feet of saturated sands and gravels at its crossing of Hempstead Brook. The City of Groton has also commissioned additional test wells adjacent to Smith Lake after Reference 3 was published.

Water quality of the groundwater adjacent to the Groton Reservoir System would in general reflect the chemical composition of the surface water of the present system of reservoirs. Some local variation is possible, and under certain conditions and at some isolated points, the groundwater might exhibit a much higher concentration of some particular constituent.

A yield equal to the yield quoted for extraction of surface water should be possible if a sufficient number of well sites could be developed so that total well pumping capacity equaled or exceeded this yield. It is likely that a responsible and thorough study would conclude that the most advantageous water supply management might be the combined utilization of both groundwater and surface water with a somewhat greater potential yield resulting from the interception of some portion of reservoir water which now enters the groundwater system and flows to the ocean.

The nearest water distribution system water mains to the various areas of interest, expressed in connection with a possible program to utilize groundwater facilities for supply purposes, run along the west side of the Groton Reservoir System. In all probability, the greatest potential for the installation of such facilities would be expected to exist on the easterly side of the reservoirs.

Supplemental information with respect to these sites includes a recent letter to SCWA (January .8, 1978) from the Groton Director of Utilities. In this letter he expressed a strong interest in groundwater development and use for the City of Groton. This interest is based on the installation of wells in permeable sands and gravels adjacent to the reservoir system presently used for water supply purposes. The reasoning for such use is to alleviate high summer temperature of delivered water and to provide an alternative to expanding or replacing treatment plant capacity in future years.

Our evaluation of these sites, for purposes of this report and for consideration of the sites for further study, is that they are of major interest in connection with the overall planning of Groton's future water supply operation and needs. We endorse the general concepts expressed in the preceding paragraph; however, the economic feasibility and the actual practicality of installing a complex system of wells for the purposes described has not yet been established.



## GROTON - Hempstead Brook - Site 1-11

The location of this site is on the Uncasville sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of the junction of Hempstead and Beaverdam Brooks. This should not preclude an extension of this interest either upstream or downstream of the particular location noted above.

Well data presented in Reference 3 does not include any water wells in the immediate vicinity. State highway borings for Route 184, approximately one-quarter mile southerly of the specific site location, describes a layer of silt below which sand and gravel is present to a depth of 26 feet. Reference 6f maps stratified drift deposits extending for some two miles to the north along Hempstead Brook.

Water quality data was not recorded for groundwater at this site, or for any area in the immediate vicinity, in any of the reference reviewed.

A yield of 0.56 was adopted for the site based on a tributary drainage area of 2.8 square miles. No other figures are available in any reference reviewed to provide a basis by which this figure might be compared with other yield estimates.

The nearest water distribution system to the specific area of interest is the public water supply system of the City of Groton. A 12-inch main, along Route 184, is some 1,000 to 1,400 feet from the location designated as Site 1-1 and the 10-inch main on Burning Tree Drive is slightly closer.

Our evaluation of this site, for purposes of this report and consideration of the location for further study, is that it does appear to be of interest. The location is on the watershed of the Groton Reservoir System. However, it is at some distance from the surface water reservoirs of this system. The yield value assigned would be somewhat dependent on induced stream infiltration rather than induced reservoir infiltration. For this reason it has been treated separately and has not been included in the discussion of Sites 1-8, 1-9, and 1-10. The fact that groundwater withdrawals from this site would intercept and divert water that would, for the most part, enter the reservoir system, might be considered an unfavorable aspect of developing this site. A possible favorable consideration would be that development and use of water from this site might well be economically practical in the future when demand or other circumstances necessitate an addition or renovations to the City's filter plant. Its proximity to large water mains, together with the understanding that the yield figure assigned may prove too conservative, might indicate possible interest as a part of a first step in a program of reducing Groton's dependence on its filter plant.



## LEDYARD - Flat Brook - Site 2-1

The location of this site is on the Uncasville quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of the intersection of Baldwin Hill Road and Long Cove Road in Ledyard.

Well data presented in Reference 3 locates three test wells installed as part of an exploratory water program for the nearby U. S. Naval Submarine Base. These test wells designated as 93, 94, 95, and shown on Plate A of Reference 3, were installed approximately 1,000 feet south of the specific area of interest noted above. The test wells were not successful in locating a suitable permeable subsurface material and no further work in this immediate area was attempted under this 1964 program. Two drilled wells with a combined capacity of 30 gpm for the Grandview Mobile Home Park were also reported within the area of interest.

Water quality data was not recorded for groundwater at this site, or for any area in the immediate vicinity, in the referenced reviewed. Water quality of the mobile trailer park drilled wells is unlikely to be representative of water which would be found in the unconsolidated formations in this area.

A yield of 0.22 mgd was adopted for this site based on a tributary area of 1.1 square mile.

The nearest water distribution system, other than the mobile home park noted above, is SCWA's TWR Division, which would be about one mile away along Long Cove Road. However, the amount of housing built between Long Cove and Gales Ferry may eventually promote the installation of a water main system to a point within a reasonable distance to the site in question.

Our evaluation of this site for purposes of this report and consideration of the location for further study is that it appears to be of some minor interest. This does not mean that it should not be included in an early program of groundwater exploration as the expansion of domestic housing could conceivably occupy the most, or only, locations suitable for groundwater development if such locations are not tested and protected by acquisition or other means. This assessment takes into account the following unfavorable aspect of the site.

- a. Past exploratory test wells were not successful in locating a suitable location for groundwater development.

The following condition is considered favorable to the site.

- a. Potential yield may be of a magnitude economically feasible to exploit.



## LEDYARD - Pine Brook - Site 2-2

The location of this site places it on the Uncasville quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of the Pine Brook crossing of Route 12 in Ledyard (near Gales Ferry).

Well Data presented in Reference 3 includes various exploratory test wells, installed in this general area under a 1964 U. S. Naval Submarine Base program, which showed a relatively extensive sand and gravel formation. A 2-1/2 inch diameter well in this general area, included in the 1964 program, was pump tested at 76 gpm. One well, designated as III in Reference 3, was installed as an 8-inch well and equipped with a well screen between 70 and 80 feet in depth. This well was pump tested at 239 gpm and a specific capacity of 4.9 gpm per foot of drawdown was reported. It is assumed that both of the wells discussed were at the same location. Reference 4a notes that two low capacity wells were being used to supply SCWA's FVH Division with a combined pump capacity of 60 gpm. It is our understanding that these wells are barely adequate to meet present demands. These wells may not have any relevance to the site in question, as they are about 0.7 mile away.

Water quality data was not recorded for groundwater at this site, or for any area in the immediate vicinity, in any of the references reviewed.

A yield of 0.28 mgd was adopted for this site based on a tributary area of 1.4 square mile. The wells at Site 2-10, discussed later, withdraw water from this watershed. The storage capacity of Pine Swamp might permit these wells at Site 2-10 to pump amounts in excess of assigned yields on a watershed basis. Even with this consideration, it is not felt appropriate to reduce the quoted yield figure for Site 2-2 below an 0.2 mgd estimate.

The nearest water distribution system is the system that was installed as the Ferry View Heights Water Company. The water mains of this system are within 1,000 feet of the general location of the site.

Our evaluation of this site for purposes of this report is that it does offer sufficient potential for groundwater use to be of interest and should be considered in any further study of groundwater availability for water supply purposes. This assessment takes into account the following unfavorable aspect of the site:

Relative high density of homes just upstream of the site.

The following conditions are considered favorable to the site:

- a. Prior test well work indicates the presence of permeable sands and gravels in the area.
- b. Aquifer materials apparently are present to depths exceeding 70 feet.



### LEDYARD - Tom Allyn Brook - Site 2-3

The location of this site is on the Uncasville quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of the Tom Allyn Brook crossing of Route 12 in Ledyard (near Allyn's Point).

Well data presented in Reference 3 locates wells 29 through 36, in addition to wells 123 and 124, adjacent to the Dow Chemical Plant just downstream of that site. These wells all encountered permeable sand and gravels. Well 29, as designed in Reference 3, is reported to be an 8-inch gravel packed well, 35 feet deep, tested at 158 gpm at which the specific capacity was 42.0 gpm per foot of drawdown, equipped with a 75 gpm pump which operates 24 hours per day. Wells 123 and 124 were bedrock wells pumped at 4 gpm, at which rate the well was reported to exhibit a specific capacity of 0.02 gpm per foot of drawdown. Other bedrock wells were installed 1,000 feet or more easterly of the Dow Chemical Plant in 1965. These wells were east of Route 12 along Tom Allyn's Brook. Reference 3 lists five such wells with number 126 being the most productive. This well was pumped at 80 gpm, at which rate the specific capacity was 0.27 gpm per foot of drawdown. In this area one shallow dug well was installed in sand and gravel by Dow Chemical. The yield for this well was reported to be 20 gpm but it was unusual and the information reported was generally incomplete. The most productive of the Dow Chemical wells was reported to be 44 which was located on Tom Allyn Brook at its junction with the Thames River. This well showed a specific capacity of 125 gpm per foot of drawdown when pumped at 250 gpm.

Water quality data was not recorded for groundwater at this site, or for any area in the immediate vicinity, in the references reviewed.

A yield of 0.75 mgd was adopted based on a tributary area of 1.5 square miles. Even though the Dow Chemical Company is utilizing groundwater downstream of the site, no adjustment in yield is felt necessary.

The nearest water distribution system is the system which has been historically serviced by Dow Chemical. This system is anticipated to be about 1,000 feet from specific areas of interest at this site.

Our evaluation of this site for purposes of this report is that it does offer sufficient potential for groundwater use to be of interest and should be considered in any further study of groundwater availability for water supply purposes. This assessment takes into account the following unfavorable aspect of the site:

Proximity to chemical plant and unknown pollution potential would require careful evaluation as part of any future studies of potential groundwater use at this location.

The following condition is considered favorable to this site:

Prior test well work indicates the presence of permeable sands and gravels in the area.



#### LEDYARD - Avery Brook - Site 2-4

The location of this site places it on the Uncasville quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of the Avery Brook crossing of Avery Hill Road in Ledyard.

Well data presented in Reference 3 indicates seven water wells in the immediate vicinity of the Avery Brook (2-4) site. All wells are reported to be completed in sand and gravel materials. These wells were varied in depth from 17 feet to 53 feet. Three of these 2-1/2 inch diameter wells were pumped at 60 gpm or greater. Reference 4a notes that a 250 gpm capacity pump was installed in a 48-foot deep gravel packed well. Daily output was approximately 5,500 gallons in 1968, and this facility provided service to ten houses and a church in addition to a Pfizer research annex east of the Juliet Long School.

Water quality data was not recorded for groundwater at this site, or for any area in the immediate vicinity, in the references reviewed. However, Reference 4a did note that a chemical (hexametaphosphate) was added for the control of the iron content of the Pfizer well water.

A yield of 0.4 mgd was adopted for this site based on a tributary area of 2.0 square miles. This would need to be reviewed in any further study of groundwater availability to determine the effect of apparent diversion of some of the Avery Brook flow into Rosemond Lake.

The nearest water distribution system is that of the Pfizer system which is anticipated to be at a distance of about 1,000 feet or less.

Our evaluation of this site for purposes of this report is that it does offer sufficient potential for groundwater use to be of interest and should be considered in any further study of groundwater availability for water supply purposes. This assessment takes into account the following unfavorable aspect of the site:

Possible problem with the amount of iron in the groundwater at this site.

The following condition is considered favorable to the site:

Prior test well work indicates the presence of permeable sands and gravels in the area.

#### LEDYARD - Haleys Brook - Site 2-5

The location of this site is on the Uncasville quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of a point approximately 1,500 feet southwesterly of the intersection of Route 116 and Rose Hill Road in Ledyard close to the Ledyard-Preston town line.



Well data presented in Reference 3 included only one 6-inch diameter well in the general vicinity of Site 2-6. This well, located in the Town of Preston, is approximately 2,000 feet northeasterly of the point of interest and is completed in bedrock. Reference 4a does make reference to a USGS auger hole one-half mile south of the specific area of interest. This information appeared to indicate stratified drift materials but finer grained than would generally be considered favorable for locating a suitable municipal groundwater supply source.

Water quality data was not recorded for groundwater at this site, or for any other area in the immediate vicinity, in the references reviewed.

A yield of 1.5 mgd was adopted for this site based on a tributary area of 3.0 square miles.

The nearest water distribution system is the small Avery Hill Association. Following the existing road pattern, this system is about four miles from the site and is isolated from it without going through a part of the Town of Preston. The cross-country distance is relatively short to Avery Hill Road at the Poquetanuck Cove End where a substantial number of houses have been constructed during the 1958-1968 decade.

Our evaluation of this site, for purposes of this report, is that it does offer sufficient potential for groundwater use to be of interest and should be considered in any further study of groundwater availability for water supply purposes. This assessment takes into account the following unfavorable aspect of the site.

Evidence from one location southerly of the site of finer grained stratified drift deposits than considered favorable for development of wells with capacities suitable for municipal purposes.

The following conditions are considered favorable to the site.

- a. The formation present at the site is anticipated to be stratified drift and more permeable conditions may be found than experienced in the single exploratory hole one-half mile to the south.
- b. The tributary area to the site is of sufficient size as to anticipate a substantial yield if subsurface material is of a nature to permit the installation of municipal capacity wells.

#### LEDYARD - Joe Clark Brook - Site 2-6

The location of this site places it on the Uncasville quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity approximately 1,500 ft southwesterly of the intersection of Route 117 and Rose Hill Road in Ledyard close to the Ledyard-Preston town line.



Well data presented in Reference 3 included only one 6-in diameter well in the general vicinity of Site 2-6. This well, located in the Town of Preston, is approximately 2,000 ft northeasterly of the point of interest and is completed in bedrock. Reference 4a does refer to a USGS auger hole one-half mile south of the specific area of interest. This information appeared to indicate stratified drift materials, but finer grained than would generally be considered favorable for locating a suitable municipal groundwater supply source.

Water quality data was not recorded for groundwater at this site, or for any other area in the immediate vicinity, in the references reviewed.

A yield of 1.5 mgd was adopted for this site based on a tributary area of 3.0 square miles.

The nearest water distribution system is the small Avery Hill Association. The system is about four miles from the site, following existing roadways. The cross-country distance is relatively short to Avery Hill Road at the Poquetanuck Cove End where a substantial number of houses have been constructed during the 1958-1968 decade.

Our evaluation of this site, for purposes of this report, is that it does offer sufficient potential for groundwater use to be of interest and should be considered in any further study of groundwater availability for water supply purposes. This assessment takes into account the following unfavorable aspect of the site.

Evidence from one location southerly of the site of finer grained stratified drift deposits than considered favorable for development of wells with capacities suitable for municipal purposes.

The following conditions are considered favorable to the site.

- a. The formation present at the site is anticipated to be stratified drift and more permeable conditions may be found than experienced in the single exploratory hole reported one-half mile to the south.
- b. The tributary area to the site is of sufficient size as to anticipate a substantial yield if subsurface material is of a nature to permit the installation of municipal capacity wells.

#### LEDYARD - Upper Williams Brook - Site 2-7

The location of this site is on the Old Mystic quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of Williams Brook intersection of Lee Brook approximately 2,000 feet south of the intersection of Iron Street and Shewville Road in Ledyard.



Well data presented in Reference 3 does not include any water wells in the immediate vicinity. The closest wells to the site are those put in for Lifetime Homes about one-half mile south of the area of interest. Plates in Reference 4a do show the area as stratified drift.

Water quality data was not recorded for groundwater at this site, or for any area in the immediate vicinity, in the references reviewed. The distance between this site and the Lifetime Home well (see discussion of Site 2-8) is such as to question any consideration that the water would be similar in quality.

A yield of 0.88 mgd was adopted for this site based on a tributary area of 4.4 square miles.

The nearest water distribution system is the system installed for Lifetime Homes which is one-half mile, or more, from Site 2-7.

Our evaluation of this site, for purposes of this report, is that while basic information is almost totally absent, the fact that water supply facilities were actually installed lower down on Williams Brook does imply a possibility that this site on Upper Williams Brook might be favorable for the development of a similar supply.

#### LEDYARD - Lower Williams Brook - Site 2-8

The location of this site is on the Old Mystic quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of a point on Williams Brook that is approximately 100 feet west of the intersection of Town Farm Road and Shewville Road in Ledyard. This area is one in which a production well was installed and is operated as a supply to the Lifetime Homes subdivision.

Well data presented in Reference 3 locates four water wells in the immediate vicinity of the point of interest (24, 25, 73, 74). All wells are completed in sand and gravel materials. In 1968 the one supply well was equipped with a 300 gpm pump which was estimated to supply an average demand of 150,000 gallons per day. A site for a second well 150 feet east of the one utilized had been selected and tested.

Water quality data included in Reference 4a included the following values only:

Odor	occasionally musty
Turbidity	0 to 2 units
pH	6.4 to 7.7
Total Hardness	20 mg/l

A yield of 1.12 mgd was adopted for this site based on a tributary area of 5.6 square miles. This figure includes 1.2 square miles of additional tributary area in addition to the 4.4 square miles quoted for Upper Williams Brook (Site 2-7).



The nearest water distribution system is the system that supplies the Lifetime Homes Subdivision for which the well discussed above is utilized as a source of water.

Our evaluation of this site, for purposes of this report, is that it is currently being used as a source of community water supply and has been reported to have been tested for the purpose of any augmenting of the supply obtained from the originally installed facilities. Additional studies in connection with providing additional supply facilities would be needed to fully evaluate information and data generated by actual operation of the existing supply. Favorable to this specific site, and any site directly downstream, are:

- a. Location of sewage disposal facilities for the Lifetime Homes Subdivision.
- b. A substantial yield is anticipated based on a relatively extensive drainage area tributary to this site.

#### LEDYARD - Whitford Brook - Site 2-9

The location of this site is on the Old Mystic quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of Whitford Brook approximately 2,000 feet southwest of the intersection of Shewville Road and Whitford Road in Ledyard, near the Ledyard-Stonington town line.

Well data presented in Reference 3 locates one water well (163) in the general vicinity of the point of interest. This well is a gravel pack well installed by the Mystic Valley Water Company in Stonington. It was tested at 880 gpm (1.27 mgd) and exhibited a specific gravity of 20.7 gpm per foot of drawdown. This well had been developed as an additional source of water supply for the Mystic Valley Water Company. This specific site has also been the area of extensive testing by the USGS as reported in Reference 1. The original area of interest inferred from the extent of the testing done also extended up Williams Brook almost to Site 2-8. Reference 1 provides evidence that this reach of Williams Brook does not appear favorable for the development of wells of capacities suitable for community facilities. Reference 1 does not make mention of the installation and testing of the gravel packed well by the Mystic Valley Water Company.

Water quality data was not recorded for groundwater at this site. However, the Mystic Valley Water Company's well developed has substantially high concentrations of iron.

A yield of 1.12 mgd was adopted for this site based on a tributary area of 5.6 square miles. This figure does not include the drainage area of Williams Brook upstream of Site 2-8. This figure is slightly more conservative than the figure of 1.4 mgd published in Reference 1. This higher figure probably represents a truer value inasmuch as it was derived from a specific study of the area rather than a generalized estimate.



The nearest water distribution system is the well site on Whitford Brook installed for the Mystic Valley Water Company which is actually within Site 2-9.

Our evaluation of this site, for purposes of this report, is that the site can be apparently developed with facilities that are capable of extracting water in excess of the generalized yield figures used in this report. Also, the installation of a number of wells may be installed with combined capacities exceeding the more detailed analysis and yield figures quoted in Reference 1. This is not intended to imply that a series of wells with a combined pumping capacity that substantially exceeds these figures would be in any way improper. However, additional study and professional advice on the proper operation of such wells should be obtained.

LEDYARD - Tower Water Company (SCWA's TWR Division) - Site 2-10

The location of this site is on the Uncasville quadrangle sheet of the USGS topographic map series. The specific area of interest is the southwest side of Pine Swamp.

Well data presented in Reference 3 includes to operating wells and one abandoned well which was installed between 1960 and 1962. These wells supply a SCWA water system (TWR Division). Over 30 feet of saturated sands and gravels are reported at the site. The two operating wells supplied some 400 homes in 1969. One well was tested at 300 gpm and the other is reported to have an installed pump capacity of 125 gpm at which a capacity of 5.0 gpm per foot of drawdown was reported.

A yield of 0.11 mgd (75 gpm) equal to what would be assigned for a one-half square mile drainage area according to the normal procedure for that report was adopted for this site.

The nearest water distribution system is one for which the wells described above were installed to supply.

Our evaluation of this site, for the purposes of this report, is that further development of this site is not warranted, as present installed pumping capacity probably exceeds any reasonable estimate of long-term yield. This does not mean to imply that this is not an advisable practice. Dual wells for reliability of operation are desirable. This example does point out a number of points needed to be kept in mind and which have been stated in general terms elsewhere in this report.

- a. Our original review of groundwater favorability in this area was based on very little actual field data. Subsequent data provided by SCWA appears to provide a more optimistic view of supplemental groundwater availability than might be assumed by the yield figure noted above. Also, areas on Plate B of Reference 2 which do not show thick sections of saturated stratified drift should not be automatically omitted from future groundwater availability studies.



- b. That the assigned yield figures used in this report are, for many cases, conservative as they take into account minimal storage capabilities of adjacent swamps and surface water bodies and this generality may not be truly appropriate for a particular site. They are useful for comparative considerations and are presented on that basis.
- c. That relatively small supplies with limited yield can be useful and should not be ignored.

#### MONTVILLE - Oxoboxo Lake Area - Sites 3-1 and 3-2

The location of these sites places them on the Montville quadrangle sheet of the USGS topographic map series. The areas of interest are essentially the same as discussed in the 1975 Lenard Report (Reference 6e) in which they were referred to as the Upper Aquifer and the Lower Aquifer.

Well data presented in Reference 3 includes only a single private well, completed in sand, in the area of Oxoboxo Lake and no wells are represented between Oxoboxo Lake and Scofield Pond. Three dug wells, completed in sand and gravel, are located in Salem to the south of Gardner Lake. Reference 6e does mention a program of investigation that had been initiated jointly by SCWA and USGS in 1969 that was aborted when USGS auger equipment was unable to penetrate the stratified drift deposits at either the Upper Aquifer or Lower Aquifer areas. SCWA has considered further investigation of the area (Reference 7) utilizing conventional but relatively large diameter exploratory test wells but has not taken any action to implement such a program. SCWA files also contain information which appears to indicate that Oxoboxo Lake is not directly connected, or at least offers little in the way of recharge, to adjacent permeable subsurface formations near some areas of the Lake. Well data, at least for purposes of this report, has been omitted for any of the Montville Water Works Company wells since such information was not considered to be relevant to the areas of interest discussed.

Water quality data was not recorded on any detail for either of the areas of interest. Reference 5 did note that iron and manganese were not expected to be present in objectionable concentrations, and cited Reference 2 for this statement.

A yield for the Upper Aquifer of 2.0 mgd and an additional yield of 1.6 mgd for the Lower Aquifer were quoted in Reference 6e (see discussion under evaluation of sites).

The nearest water distribution system is the system of the Montville Water Works Company, now owned and operated by SCWA, which could be as much as 2-1/2 miles away from potential facilities at either Site 3-1 or 3-2.



Our evaluation of these sites is a general endorsement of the Summary and Conclusion presented in the 1975 Lenard report (Reference 6e) although we do question the size of the drainage area and the potential yield figure quoted for the Lower Aquifer (Site 3-2) which we feel may be two or three times an appropriate conservation figure. The conclusion applicable to groundwater development included in Reference 6e were:

- There are two general aquifers which can be considered for groundwater development; the "upper" aquifer between Oxoboxo and Gardner Lakes, and the "lower" aquifer between Oxoboxo Lake and Schofield Pond.
- The anticipated dependable long-term yield of the two aquifers is 3.6 mgd. If further explorations prove that the coarse-grain deposits are more substantial than anticipated, and if the properties can be acquired to develop the aquifers to their full capacity, the combined groundwater resources may yield a dependable long-term yield of 5.0 mgd.
- Further groundwater exploration is necessary to determine the real potential to the aquifers.

#### MONTVILLE - Wheeler Pond - Site 3-3

The location of this site is on the Montville quadrangle sheet of the USGS topographic map series. A review of the topography adjacent to Wheeler Pond indicates that various areas along the shoreline could be of interest in a future exploration program.

Well data presented in Reference 3 locates three water wells (31, 32, 33) in the general vicinity of the point of interest. Well #31 now supplies two people and formerly supplied eight. Well #32 supplies water for 45 people and is a USGS observation well. Well #33 formerly supplied water (3,000 gpd) for 65 people. All three wells are completed in bedrock.

Water quality data included in Reference 3 for well #32 showed iron and manganese concentrations of 0.03 and 0.0 mg/l, respectively. The presence of the Town landfill on the edge of Wheeler Pond raises questions relative to possible pollution problems with groundwater in this area.

A yield of this site is complicated by the presence of Wheeler Pond and the storage provided by the pond. If permeable subsurface materials were located with conditions such as to permit the pond to provide significant recharge to the aquifer, a yield of well or wells might very well approach or exceed 1.5 mgd. Development of a groundwater supply facility at Site 3-2 would, in all probability, reduce this figure.



The nearest water distribution system is the small system installed for the Country Estates housing development off Old Colchester Road. It is probable that this development would be more than a mile from any potential groundwater facility of any appreciable yield in the area of interest expressed for Site 3-3.

Our evaluation of this site, for purposes of this report, is that it appears of possible secondary interest for inclusion in any future groundwater study program. This does not mean to imply that it should be relocated, as any site with a potential yield ascribed to it would normally be in a first priority status. The less than first priority status is suggested because of the following circumstances.

- a. The presence of the Town's landfill adjacent to Wheeler Pond.
- b. Uncertainty as to the potential for groundwater development in the Oxoboxo area.
- c. The distance of this site from an area of major water use.

It is felt that the proper role for this site would be to include it in any study of the Oxoboxo area to attempt to come to a preliminary understanding of the unfavorable aspects mentioned above with a minimum amount of field work and contractual costs for field work.

#### MONTVILLE - Oxoboxo Brook - Site 3-4

The location of this site places it on the Uncasville quadrangle sheet of the USGS topographic map series. The specific area of interest is the general vicinity of the Oxoboxo Brook crossing of Route 52 (Connecticut Turnpike) near Uncasville.

Well data presented in Reference 3 includes two water wells (25, 26) and four highway borings (24, 31, 32, 37). Both water wells were completed in sand and gravel materials and are since abandoned. Highway borings (24, 31, 32, 37) showed that sand and gravel materials are present at depths anywhere from 3 feet to 50 feet depending upon boring location.

Water quality data included in Reference 3 for well #25 showed iron and manganese concentrations of 0.38 and 0.0 mg/l, respectively. This amount of iron is above the Federal and State standards but is low enough to offer the potential of low cost control.

A yield of 0.46 mgd was adopted for this site based on a tributary area of 2.3 square miles.

The nearest water distribution system is the Kitemaug Orchards Association more than 1-1/2 miles to the north of this site. However, the relatively built up section of Uncasville is directly adjacent to the site.



Our evaluation of this site, for purposes of this report, is that it should be of interest for future study. There are unfavorable aspects as shown below:

- a. The relatively built-up area directly adjacent to the site limits the area for sufficient protection.
- b. Water quality problems are possible with evidence indicating that iron concentrations may exceed Federal and State requirements.
- c. Proximity to a major highway which may result in chloride problems relating to winter de-icing operation.

The favorable aspects include:

- a. Proximity to potential users.
- b. Relatively substantial yield potential.

#### MONTVILLE - Falls Brook - Site 3-5

The location of this site places it on the Montville quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of a point near Falls Brook approximately 1,500 ft. east of the Rogers Cemetery in Montville.

Well data presented in Reference 3 does not include any water wells in the immediate vicinity.

Water quality data was not recorded for groundwater at this site, or for any area in the immediate vicinity, in the references reviewed.

A yield of 0.28 mgd was adopted for this site based on a tributary area of 1.4 square miles.

The nearest water distribution system appears to be over two miles from this site.

Our evaluation of this site, for purposes of this report, is that it is too remote and does not offer sufficient yield to be of immediate interest for any community water supply purposes.

#### MONTVILLE - Johnson Pond - Site 3-6

The location of this site places it on the Uncasville quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of the intersection of Route 52 and Raymond Hill Road at Johnson Pond.



Well data presented in Reference 3 locates seven water wells (2, 20, 24, 81, 82, 83, 94) in the general vicinity of the point in question. Well #2 is presently unused because of salt water intrusion problems. Well #20 is contaminated and has been abandoned. Well #24 supplies 100 inmates and 25 employees at the New Lond State Jail with 10,000 gpd. Well #82 supplies 1,100± gpd. Wells #81 and #83 are inadequate for supply. Well #94 supplies four stores adequately. All wells are completed in bedrock except for Well #83 which is completed in sand and gravel materials.

Water quality data included in Reference 3 for well #24 showed iron and manganese concentrations of 0.02 and 0.02 mg/l, respectively.

A yield of 1.4 mgd was adopted for this site on the basis of a tributary area of 7 square miles.

The nearest water distribution system is the Kitemaug Orchards Association, but a substantial number of potential customers are present along the one and one-half miles of roads that separate this system from Site 1-6.

Our evaluation of this site, for purposes of this report, is that it is of interest in any future study of groundwater availability.

The only obvious unfavorable aspect to this location is:

A rather confined location between a drive-in theatre and the Connecticut Turnpike and a possible problem with chlorides resulting from de-icing operations.

Favorable aspects to this location are:

- a. Proximity to a presently built-up area and potential area of use.
- b. Magnitude of potential yield is substantial.

#### MONTVILLE - Great Plain Brook - Site 3-7

The location of this site places it on the Norwich quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general vicinity of the junction of Trading Cove Brook, Great Plain Brook, and Gardner Brook. The locations of almost all of the sites which would appear practical from a review of the various reference sources are in Norwich. Melvin (Reference 1) sites 2 of 7 suggest well locations barely within Montville with the remaining 5 in Norwich. He designates this site as Area J in Reference 1.

Well data presented in Reference 3 locates one water well (27) and one highway boring (32) in the vicinity of the area of interest. (Both the well and the boring are located in Norwich.) Well #27, supplying 100 gpd, is completed in sand and gravel materials. State highway boring #32 shows a four-foot layer of silt underlain by layers of sands and gravels up to a depth of 43 feet.



Water quality data, included in Reference 3 for well #27, showed iron and manganese concentrations of 0.05 and 0.0 mg/l, respectively.

A yield of 2.4 mgd was adopted based on the standard used in connection with most sites discussed in this report of 0.2 mgd per square mile of tributary area. As cautioned elsewhere, yield is dependent on many variables including the location of specific well sites with adequate capacity to develop a potential yield in the event that such was actually present. Melvin, in Reference 1, proposed four production wells at the junction of Trading Cove and Gardner Brooks and estimates a yield of 1.1 mgd for this group of wells. West of this first site, just east of the Leffingwell School, he proposes three production wells along Trading Cove Brook for which he estimates a yield of 0.8 mgd. This 1.0 mgd total figure is based on a detailed model analysis and, consequently, a more acceptable figure than the generalized figure of 2.4 mgd presented above for comparative purposes.

The nearest water distribution system is the public water supply system of the City of Norwich. A 12-inch main running along the New London Turnpike from Norwich to Montville is located approximately 1,500 feet from the site.

Our evaluation of this site, for purposes of this report, is that it is of interest in any future groundwater studies. The test well program summarized in Reference 1 indicates the general feasibility of utilizing the site for the development of a groundwater supply. The further studies, referred to above, would include modification or verification of the well sitings suggested by Melvin pumping tests and a variety of additional information upon which to base practical design of the proposed facilities would be necessary.

#### MONTVILLE - Route 52 - Site 3-8

The location of this site places it on the Uncasville quadrangle sheet of the USGS topographic map series. The specific area of interest is in the general area along Stony Brook to the south of the intersection of Route 52 and Gallivan Road.

Well data presented in Reference 3 does not include any water wells in the immediate vicinity. However, two highway borings (10, 13) are located in the immediate vicinity of the site. Soils at both boring locations are mainly composed of fine sands and meet bedrock refusal at 55 to 65 feet. Highway boring (46) showed coarser material at the Turnpike Service Area 4,000 feet south of the two borings noted above. Only 15 feet was recorded for the service area boring, but no mention was made of encountering rock or refusal.

Water quality data was not recorded for groundwater at this site, or any area in the immediate vicinity, in the references reviewed.

A yield of 1.0 mgd was adopted on the basis of a tributary area of 5.0 square miles.



The nearest water distribution system is that of the G & J Water Company, which is only a little over a mile away in a direct line.

Our evaluation of this site, for purposes of this report, is that it does appear to have a place in any future study of groundwater availability. This assessment takes into account the following unfavorable aspects of the site:

- a. Probable shallow depth of stratified drift.
- b. Proximity to a major highway and possible chloride problem resulting from de-icing operations.

Favorable aspects would include:

- a. If stratified drift is shallow, exploratory testing will not be costly to verify condition.
- b. Potential yield is of sufficient magnitude to be of major interest should suitable permeable subsurface conditions be found.

#### MONTVILLE - Latimer Brook - Sites 3-9, 3-10, and 3-11

The location of these sites is on the Montville quadrangle sheet of the USGS topographic map series. The general areas of interest are along Latimer Brook.

Well data presented in Reference 3 does not include any water wells in the immediate vicinity. Plate B of Reference 2 shows the entire course of Latimer Brook from the southwest corner of Montville to the Barnes Reservoir as stratified drift.

Water quality data was not recorded for groundwater at this site, or for any area in the immediate vicinity, in the references reviewed.

A yield of each site is based on the tributary area which would support the yield without regard to the area above the next site upstream. A yield of 0.28 mgd was adopted for Site 3-9, based on a tributary area of 1.4 square miles. Actually, the total tributary area to this point is 5.7 square miles, including area assigned to 3-10 and 3-11. A yield of 0.28 mgd was also adopted for Site 3-10 and a value of 0.38 mgd was adopted for Site 3-11.

The nearest water distribution system is probably beyond any distance which might be considered reasonable within the foreseeable future. However, Site 3-10 is about a mile from the Bogne Brook Reservoir and Site 3-11 is only about 1,000 feet from Beckwith Pond.



Our evaluation of the Latimer Brook sites is that, with the possible of Site 3-11, they offer little interest for further study at this time. If housing development should materialize in close proximity to these sites, they might offer a more attractive alternative to a possible surface water source of supply. Site 3-11 does, by reason of its close proximity to Beckwith Pond, appear to warrant further consideration. It is also possible that a greater yield figure might result from a more detailed analysis. It is doubtful that a well at this site would increase the rate of loss of surface water in Beckwith Pond to the groundwater system, but it is entirely possible that losses in addition to groundwater movement under the Pond could be intercepted by such a well in addition to extracting water from the Latimer Brook system.

#### WATERFORD - Oil Mill Brook - Site 4-1

The location of this site places it on the Niantic quadrangle sheet of the USGS topographic map series. The site also extends to the north into the Montville quadrangle. The specific area of interest is along Oil Mill Brook for about one-half mile north of and south of I-95.

Well data presented in Reference 3 reports a 16-foot deep domestic dry well completed in sand and gravel with a static water level 10.5 feet below a ground surface elevation of 18 feet. Also, logs of Connecticut Highway bridge borings, reported in Reference 6a, indicate sand and gravel to depths of approximately 50 feet. Reference contains information on seismic profiles done both north and south of the State Highway. These profiles to the north provide encouragement that permeable sand and gravel were present to depths of 50 feet. This interpretative seismic work was not verified by two exploratory wells, which encountered compact material and were not able to penetrate below a 20-foot depth.

Water quality data was not recorded for groundwater at this site, or for any area in the immediate vicinity. The proximity of the site to the Niantic River would make it susceptible to salt water intrusion.

Yield for consideration of overall favorability was at 0.4 mgd, based on a watershed of Lakes Pond Brook above Way Hill Road. This exclusion has been made due to probable groundwater development taking place along Lakes Pond Brook at Site 4-2 between Way Hill Road and Lake Konomoc.

The nearest water distribution system is that of the Waterford system in which a 12-inch water main extends to the site.

Our evaluation of this site, for purposes of this report, is that past exploration work has shown that the possibility of locating moderate to large capacity wells suitable for community water supply is remote. It would not be anticipated that this site would be included in any further studies of groundwater favorability.



#### WATERFORD - Lakes Pond Brook - Site 4-2

The location of this site places it on the Montville quadrangle sheet of the USGS topographic map series. This site is the same as designated as Area Q by Melvin in Reference 1. This site is sometimes referred to as the Speedbowl Site.

Well data available for review includes the series of exploratory borings and logs presented in Reference 1.

Water quality data is commented in in Reference 5, in which it is noted that iron and manganese concentrations have been reported in amounts of 0.3 and 0.05 ppm, respectively.

A yield of 0.5 mgd was adopted by Melvin in Reference 1 for this site.

The nearest water distribution system, or possible points of connection to a water system, are the transmission mains of the New London-Waterford Supply which are adjacent to the site.

Our evaluation of the circumstances relative to further study of this site is that we understand that such a study is now being undertaken to actually develop the site for water supply purposes.

#### WATERFORD - Jordan and Nevins Brooks - Sites 4-3 through 4-6

The location of these sites are along Jordan and Nevins Brooks and coincides with the area designated as N by Melvin in Reference 1.

Well data in Reference 3 included only one private well (9) which was west of Jordan Brook. Prior exploratory and test well work had been done in the early 1960's and reported on in References 6a and 6b. Additional subsurface exploration and study was done by Melvin (Reference 1). However, no serious attention was paid to Site 4-3. Plate B of Reference 2 does show stratified drift extending both upstream and downstream of Site 4-3. A report on a seismic test in Reference 6a appeared indicative of till but the exact location of this line is in doubt.

Water quality data was not recorded for groundwater for any of these sites in Reference 3 or Reference 6a. Reference 6b notes that water samples were taken at Site 4-4, and that the analysis of these samples showed water of good quality, but the actual analysis figures were not presented.

SCWA files (Reference 7) included information that there is an old abandoned landfill at Site 4-5.

A yield of 0.26 mgd might be experienced at Site 4-3, if permeable materials were present to enable the installation of a well of adequate capacity. This figure is based on a tributary area of 1.3 square mile. Reference 6b reports that the full potential yield of Site 4-4 is 1.0 mgd. Melvin



(Reference 1) omitted Site 4-4 from his study and concentrated his efforts on Sites 4-5 and 4-6. Melvin's yield figures for Sites 4-5 and 4-6 were 0.2 mgd and 0.5 mgd, respectively.

The nearest water system to any of the sites of Jordan and Nevins Brooks is the Waterford system. Site 4-3 is near the main transmission mains leading from Lake Konomoc. The other sites are within 1,000 feet of the 20-inch transmission line which passes the Waterford Airport.

Our evaluation of the Jordan and Nevins Brooks sites is that all sites warrant some consideration relative to further study. It is understood that this is being implemented for Sites 4-4 and 4-6. These two are the most promising of those discussed as they exhibit the greatest potential yield. The evidence of the presence of a former landfill at Site 4-5 appears to add an additional unfavorable aspect as far as further consideration of this site is concerned.

#### WATERFORD - Stony Brook - Site 4-7

The location of this site places it on the Niantic quadrangle sheet of the USGS topographic map series. The specific area of interest is an area just north of the Boston Post Road.

Well data in Reference 3 includes one well (2) somewhat east of this location. These were private wells constructed in sand and gravel to a depth of 32 feet. Plate B of Reference 2 shows a rather extensive area of stratified drift downstream of this site.

Water quality data was not presented in any of the references reviewed.

A yield of 0.34 mgd was adopted based on a tributary area of 1.7 square mile.

The nearest water distribution system is the Waterford System which includes a 12-inch water main on the Boston Post Road.

Our evaluation of the site, for the purposes of this report, is that it is a site worthy of further study should a yield in a magnitude of 0.3 or 0.4 mgd be felt to be economically practical to develop.

#### WATERFORD - Gardners Wood Road - Site 4-8

The location of this site places it on the Niantic quadrangle sheet of the USGS topographic map series. The specific area of interest is an area just north of the Millstone Road.

Well data in Reference 3 includes numerous wells (50 through 60) (20) just south of this location. These were private wells constructed in sand and gravel for Henry Gardiner and the Millstone Point Club System during the period 1953 through 1956. Plate b of Reference 2 shows a rather extensive area of stratified drift upstream and downstream of this site.



Water quality information for well number 56 was included in Reference 3. This analysis showed a good quality water, without iron and manganese problems, and reported a chloride value of only 24 ppm.

A yield of 0.20 mgd was adopted based on a tributary area of 1.0 square mile.

The nearest distribution system is the Waterford system which includes a 12-inch water main on Millstone Road.

Our evaluation of the site, for purposes of this report, is that it is a site worthy of further study should a yield in a magnitude of 0.2 mgd be felt to be economically practical to develop.

#### WATERFORD - Fenger Brook - Site 4-9

The location of this site is on the New London quadrangle sheet of the USGS topographic map series. The specific area of interest is an area just east of Stuart Hill along Fenger Brook.

Well data in Reference 3 does not include any references to wells near this location. A test well was installed that met a shallow refusal under an early exploratory program reported on in Reference 6a. Plate B of Reference 2 shows a rather extensive area of stratified drift upstream and downstream of this site.

Water quality data was not present in any of the references reviewed.

A yield of 0.49 mgd was adopted based on a tributary area of 2.44 square miles.

The nearest water distribution system is the Waterford system which includes a 12-inch water main on Braman Road.

Our evaluation of the site, for purposes of this report, is that it is a site worthy of further study should a yield in a magnitude of 0.5 be felt to be economically practical to develop in this area. The past evidence of shallow refusal should be first checked by seismic survey prior to attempting additional exploratory wells.

#### WATERFORD - Green Swamp Brook - Site 4-10

The location of this site is on the Montville quadrangle sheet of the USGS topographic map series. The specific area of interest is an area just northwest of Brandegee Lake.

Well data in Reference 3 does not include any wells that are near to a single seismic survey line, as tried and reported on in Reference 6a. The results were not favorable and no exploratory wells were attempted. Plate B of Reference 2 shows a rather extensive area of stratified drift upstream and downstream of this site.



Water quality data was not present in any of the references reviewed.

A yield of 0.28 mgd was adopted based on a tributary area of 1.4 square mile.

The nearest water distribution system is the Waterford system which includes a water main on Glenvale Street.

Our evaluation of the site, for purposes of this report, is that it is a site worthy of further study should a yield in a magnitude of 0.3 mgd be felt to be economically practical to develop at this location. It is not felt to be a site where the potential of finding good permeable subsurface material is very promising, but it probably should not be omitted from consideration without attempting a minimum of additional work.

#### WATERFORD - Hunts Brook and Miller Pond - Sites 4-11 through 4-13

The location of these sites is on the Montville quadrangle sheet of the USGS topographic map series. The specific area of interest for Site 4-11 is on a tributary brook to Millers Pond just northeast of Old Colchester Road, for Site 4-12 the area of interest is just northwest of Lake Coneca, and for Site 4-13 the area of interest is between Lake Coneca and Miller Pond.

Well data in Reference 3 does not include any wells near these sites. Plate B of Reference 2 does show relatively extensive areas of stratified drift at each of the three sites. Information contained in Reference 6a includes a seismic survey line through a portion of Site 4-12 and four exploratory test wells in the general area of Site 4-13. The seismic line showed results comparative to a dense subsurface material of low permeability. The logs for the four exploratory wells in the general area of Site 4-13 all included clay in addition to sands and gravels, indicative of poorly sorted materials, if not glacial till.

Water quality data was not presented in any of the references reviewed.

A yield of 0.38 mgd was adopted for Site 4-11 based on a tributary area of 1.9 square miles. No figures are presented for Sites 4-12 and 4-13 as subsurface conditions are not considered to be suitable for the installation of groundwater supply facilities.

The nearest water distribution system to Site 4-11 is the Waterford system which includes a 12-inch main on Old Colchester Road that ends about one-half mile from the site.

Our evaluation of Site 4-11 is that it is a location which is worthy of further study. This statement is made primarily on the basis that stratified drift is expected to be present at the site and no work has been done either to verify or dispute the favorability of this site for a potential groundwater supply source. Unfavorable evidence appears to rule out Sites 4-12 and 4-13 from consideration for further studies of groundwater favorability.



#### WATERFORD - Lower Hunts Brook - Site 4-14

The location of this site places it on the Uncasville quadrangle sheet of the USGS map series. This site coincides with Location L as reported in Reference 6a.

Well data included in Reference 6a consisted of test wells and a pumping test. The pumping test was carried out at a rate of 154 gpm (0.22 mgd), but the text of Reference 6a proposed a facility of 0.24 mgd.

Water quality data is in the form of a report of analysis by the State Department of Health as reproduced in Reference 6a. This analysis showed a good quality water without any iron. However, no analysis appears to have been made for manganese.

A yield of 0.24 mgd is inferred from the text of Reference 6a.

The nearest water distribution system is the Waterford system which has a water main in Old Mill Road about 1,200 feet from Site 4-14.

Our evaluation of the site, for purposes of the report, is that the site is worthy of further study to enable a design of facilities to be made should the magnitude of yield be felt to be economically practical to develop in this area.







